AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.

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VOLUME 21. NEW YORK, THURSDAY, OCTOBER 13, 1898. NUMBER 41.

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A Ball Bearing Experience.

BY C. P. BENNS.

There are those who evidently think that any bearing which includes steel balls in its make-up is rightfully entitled to the designation of a ball bearing, which term is practically synonymous with "anti-friction" bearing. There are many evidences of this to be found in the pages of the "American Machinist," arrangements including balls which cannot possibly roll and which have every inducement to make trouble by sliding.

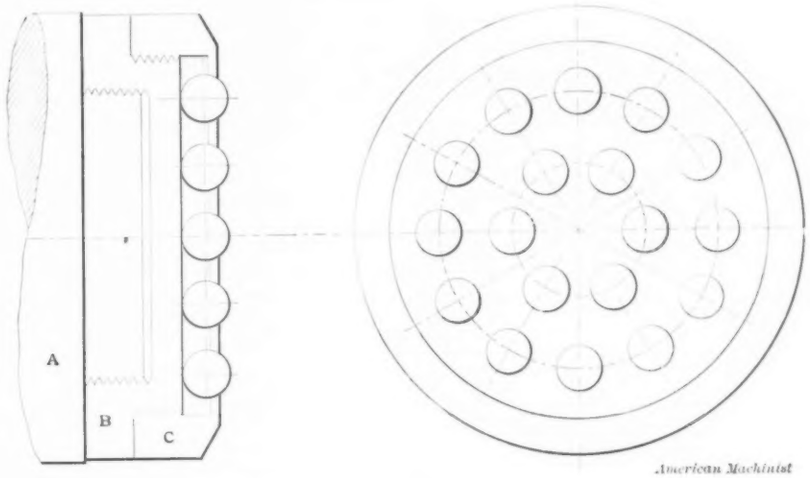

Fig. 1
A BALL BEARING THAT DID NOT WORK.

A flagrant case of the above is illustrated in Fig. 1. *A* is a 3½-inch shaft to which is applied the ball thrust bearing composed of parts *B* and *C* with 18 ⅜-inch balls. It will be noticed that *B* is screwed on to *A* and that the retainer *C* is rigidly connected to *B*, which forms one abutment for the balls. The other abutment was a flat-ended screw of diameter sufficient to include the outer circle of balls.

A moment's consideration will show that if we suppose the balls to roll on the step screw they must slide in the retainer *C*, and as their point of contact with *B* remains opposite the center of the holes in *C*, the balls must slide on *B* whatever amount they roll on the step screw. Hence we have the rolling action, which we are supposing to take place between the balls and the step screw, opposed by the sliding on *C* and on *B*. Now as we know that the rolling friction is very much less than the sliding, it follows that the combined sliding friction entirely overcomes the tendency to roll, and the balls scrape for themselves circular paths on the step screw, to the damage of both balls and screw. "Somebody" designed this thing and it actually went its way through numerous hands and was placed on the machine and tried before anyone saw that instead of an anti-friction bearing it was equivalent to taking the thrust on a series of points solid with the end of the shaft.

It fell to my lot to substitute something for the above in which the balls would roll, and the statement was made that a two-point bearing, using ⅜-inch balls, would probably be most satisfactory. Inquiry developed that a common relation between the radius of the curve of the cup or cone and the diameter of the ball was when the radius of the cup or cone was 1½ times the diameter of the ball. This gave for the present circumstances 9-16 inch as the radius of the curve on which the balls roll. In Fig. 2 *g G* and *h H* are each 9-16 inch radius. I was also told that 3-16 inch total clearance between the balls would be about right. Other considerations fixed the limit that about 2 inches should be the outside diameter of the ball race. With these data, but no experience with such a problem, a start was made, and by some figuring and a little drawing on the cut-and-try plan the result in Fig. 2 was attained, where the diameter of the ball circle is 1 15-32 inches. The surfaces *G* and *H* were struck from centers *g* and *h*, located so they looked about right. It was essential that the space between *D* and *E* be 1-32 inch.

When the lathe hand had turned the groove in *D* it looked very much too shallow, and on investigation we found that while the tool had been quite carefully made from the paper drawing it was not exactly correct and probably had not been correctly set in the lathe. The form was then very carefully laid out on a piece of blackened zinc and a line made with which the straight part of the tool was to coincide. The tools were carefully made according to the more accurate form, and when put in the lathe were set up with the straight side, which had been made to the line on the zinc plate, square with the face of the work. The cup and cone thus corresponded accurately with the drawing, but when put together with the balls in place the space between the parts *D* and *E* was more nearly ⅛ inch than 1-32 inch. This

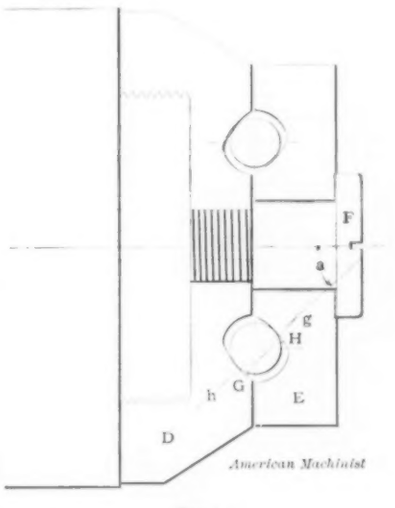

Fig. 2
TWO-POINT THRUST BEARING.

was remedied by cutting the cup and cone both deeper, to allow the parts to come to their proper position. After all this the total clearance between the balls was nearer ⅜ inch than 3-16 inch; in other words, the balls were determined

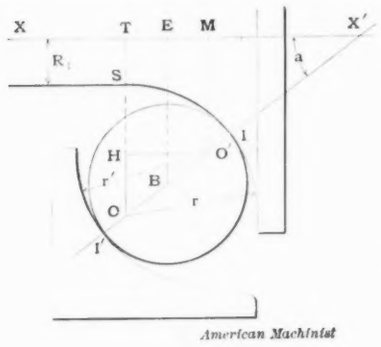

Fig. 3

TWO-POINT SHAFT BEARING.

to roll in a larger circle than I had decided it was desirable for them to occupy.

The other day I ran across a paper by C. Bourlet in "Le Genie Civil" on the theory of ball bearings, and I am tempted to translate such portions of it as bear on the above case in the hope that some other inexperienced draftsman may be spared the annoyance of the seeming vagaries in the conduct of otherwise innocent and useful steel balls.

The paper opens with a purely mathematical discussion of the forces acting on the ball, and taking into account the slight imbedding of the ball in the cup and cone on account of the load upon the bearing. We get the first ray of light when he considers the special case of a two-point bearing:

"In such a bearing the ball touches the cup and cone in but a single point each. We will suppose, as is the usual practice, that the axial sections of the cup and cone are arcs of circles, and we will first attempt to find the position of the ball. In order to adjust the bearing one screws the cup in or out of the ball case, and the ball will so place itself *that its points of contact with the cup and cone are diametrically opposite.*"

A further more or less mathematical discussion shows that this takes place when the center of the ball lies on the line joining the centers from which the curves of the cup and cone are struck. A reference to Fig. 2 will show that the assigned position of the ball was not on this line, and that therefore when the bearing was made the balls took up their proper position, which was in a circle of considerably larger radius. A little further inspection will also show that when the cup was deepened we did not reduce the diameter of the ball circle, and when the cone surface was carried back to bring the parts nearer together, that again did not reduce the diameter of the path of the balls, and therefore gave too much clearance between them.

To return to the paper: The author calls the angle between the line of centers *g h* and the axis, *a* (Fig. 2), and then deduces that for two-point bearings, as found in bicycles (not thrust bearings) the more nearly *a* approaches 90 degrees the better; also the interesting fact that theoretically there should be more wear on the cone than on the cup, which accords with observations in practice. He also shows that small balls give better theoretical results in this type of bearing than large ones do, and sums up as follows:

"The best two-point bearing is that in which the angle *a* is as nearly as possible 90 degrees and which has small balls."

The balls, however, must not be made too small to sustain the load to which they are subjected. It should not be understood from what precedes that a ball bearing would be improved by substituting smaller balls for the ones for which the bearing was designed, for the result of this would be to greatly reduce the efficiency.

The following formulas are given for determining the various parts of the bearing:

We must decide first on the smallest allowable diameter of the axle, which we will call *d*.

Then we shall have

R = radius of ball.

j = total play between balls.

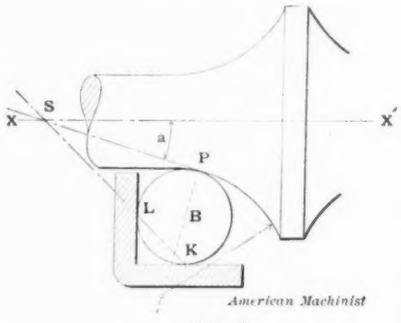

Fig. 4

THREE-POINT SHAFT BEARING.

r and r' = radii of cup and cone.

a = angle between line of centers of cup and cone and axis.

1. Determine number of balls.

For this find an angle b such that

$$\sin b = \frac{R}{d + R \sin a + r\,(1 - \frac{1}{2}\sin a) - \frac{1}{2} r \sin a}$$

and take for n the number of balls the smallest whole number that makes

$$n > \frac{180^\circ}{b}$$

2. n being determined, we know the radius of the cone, and can locate the center of the curve if we know the radius of the axle R_1 corresponding to the number of balls n, and the total play j.

$$R_1 = \frac{R}{\sin \frac{180}{n}} + \frac{j}{2n} \cot \frac{180^\circ}{n} + \frac{1}{2}(r + r' - 2R) \sin a - r.$$

3. The distance $O'M$ (Fig. 3) of the center of the curve of the cup from $X X'$ is

$$O'M = \frac{R}{\sin \frac{180^\circ}{n}} + \frac{j}{2n} \cot \frac{180^\circ}{n} - \frac{1}{2}(r + r' - 2R) \sin a$$

which locates the center for the curve of the cup.

Fig. 4 shows the conditions for the most successful working of a three-point bearing. The line joining the points of contact of the ball with the cup intersects the axis $X X'$ at S and a line through S and tangent to the ball at P should be tangent to the cone also at P. This takes place when the center of the curve of the cone is on a line passing through the center of the ball B and at right angles to the line $P S$. For this three-point bearing the angle between $P S$ and $X X'$ is called a.

Several formulas are also given as a result of the investigation of this bearing, the most interesting of which bring out the point that for the most efficient three-point bearing the angle a and the diameter of the cone should be as small as possible and the balls as large as convenient. Aside from this the second series is as interesting and no more useful in ordinary hands than those given above for the two-point.

The author's comparison between the two and three point bearing can, however, be studied with profit:

"The two kinds of ball bearing that we have studied show a great difference in the way they stand wear.

"In the two-point bearing it is the cone that suffers most, and in the three-point bearing, if properly constructed, the cup is the one to wear. It is advantageous to have the moving piece subjected to the greatest wear, as then it is distributed all around the cup or cone, as the case may be, while if the greater wear is on the fixed part the pressure always being on the same side may cause a flat spot, which would interfere with the smooth action of the balls.

"This would show that two-point bearings should be used where the cup is stationary and three-point where the cup moves. This entire investigation has been based on reducing the total friction to the smallest possible amount, but it will be easily seen that with the same total friction the bearing having the greatest number of points of contact will distribute the wear better, and so be most durable. Looked at from this point of view, it would seem that the three-point bearing had an advantage. This might lead one to put in three-point or even four-point bearings where hard work is expected."

Teachers' College, New York city.

Recognition of Engineers in the Navy.

The appointment of Commodore Mordecai T. Endicott as Chief of the Naval Bureau of Yards and Docks inaugurates a new departure in the Navy Department. Although the work of the bureau is strictly the work of civil engineers, the position of chief has heretofore been held by an officer of the line—a sailor. The appointment of Commodore Endicott, who is a civil engineer, was the outcome of a fight as arduous in character, though not as long in duration, as the struggle for recognition of engineer officers on the ships. The outcome was such a signal triumph for engineering that it was celebrated at the clubhouse of the Engineers' Club, of this city, by a dinner to Commodore Endicott. Among the speeches made was one by Commodore Loring, from which we extract below. Commodore Loring spoke on "The Early and Present Status of the Engineers of the United States Navy," and said:

MR. PRESIDENT—The event which gives occasion for our coming together here to-night has more than ordinary interest to me, and excites in my mind a gratification which I shall find it difficult to express. As you know from what our honored guest has told you, his appointment as the head of of the Bureau of Yards and Docks is an entirely new departure, in that for the first time in the history of the Navy Department, for this purely technical position, a technicist has been recognized as the proper incumbent. I am gratified because it elevates one of our professional brotherhood to an honorable and highly important position, which is a distinction in which all can share who have any claim to bear the title of engineer.

I am doubly gratified because this appointment, so eminently fit to be made, is the logical and inevitable sequence and outcome of the successful issue of the long and wearisome struggle my own corps has been carrying on these many years against the conservatism and prejudice of the naval service for the fitting acknowledgment of the importance of our duties and our standing among men. Our guest has told how a quarter of a century has been exhausted in bringing about the result we are here to celebrate. That seems a long time, measured by the longitude of our manhood, for so obvious a result, but our fight has been of twice this length of time, two generations passing away before we began to realize the moiety of our desires we now possess. * * * Whatever consideration we got was through courtesy only, sometimes withheld altogether or grudging'y given, when it could not be refused. There were engineers in the navy before the Engineer Corps was; of them there is no history and but little tradition. The first official reference to them now on record is found in a letter from Commodore M. C. Perry, I think, who, in replying to the question, "What should be the status of the persons intrusted with the care of steam engines on board ship?" said: "It would seem that such persons should be exempt from the penalty of corporal punishment." This was a good starting point; it established a distinction and gave the embryotic framework opportunity to expand and grow upward. Had this generous advice been neglected that which would have followed we could never have lived down. It bore good fruit, for shortly afterward the Engineer Corps was established, not segregated by any law or anything in privilege or social relations from officers in any other branch of the service. In 1854 military rank was conferred upon all staff officers in the navy by Congress, in which engineers were of course included. This rank was increased during the civil war by departmental order to meet the increase in grades of the line—and taken away in the same manner in 1869. In 1871 an act of Congress gave *relative* rank to officers of the staff corps, high enough in intent to satisfy, but the unfortunate introduction of the adjective robbed it largely. It was contended by our enemies that it made the act meaningless, and surely it had "a string to it," when one was asked his rank and had to qualify his answer, and explain. The kindly effects of time, the greater influence and significance of the staff, and the reduced duties of the line in the management of the mighty fighting machine, the modern battleship, have done much to soften the asperities of the old contention. And when the engineer became a student at Annapolis, putting in his four years on the same footing as the future admiral, he was over the divide, and what is now proposed was meritable. By this the exaltation of the engineer has been accomplished, his status as the equal of any secured against the assault of his enemies, if indeed he has any now.

Mighty in giving significance to our corps is the successful work of our bureau, the eminent head of which you recognize before you, as shown in the designs of the machinery of our modern ships, which has been crowned of late by the magnificent performance of the Oregon, which, at the end of 13,000 miles of rapid ocean voyaging, without an hour's delay from any cause within herself, and at the end of which she comes to the other shore of our continent ready in all respects to take at once her place in the line of battle. Skillfully as her commanding officer has performed his duty in this most successful voyage, he must divide the honors with his engineers. As most of you know, the proposition of which I have spoken is to consolidate the line and the Engineer Corps; of the two making one body, to do both duties, that on deck and that in the engine room. * * * Whether it becomes a law or not, it establishes the status of the engineer on a firm basis, from which he cannot be moved, and is far beyond the most hopeful dreams of we old veterans of the contention. Though the distinctive name indicative of our profession, disappears, the honor is all with us, for the duties to be done by this consolidated corps are nearly all of an engineering character. It is the ancient mariner, the sailor, that really disappears; his occupation's gone; little or nothing of his art is left; about the only rope yarn that remains serves to tie the mouth of a coal bag. Mechanical devices take the places of the pull and haul of the olden time, and every operation is engineering work, the efficiency of which depends entirely upon the mechanical skill of the operator.

This great change has not come without bringing its regrets, particularly to us back numbers who have passed out of the activities of the service. It robs us of our percentage, makes us obsolete and extinct, relegating us to the condition of the plesiosaurus and the dodo, creatures of the past age, bringing us to a state of innocuous desuetude. But this is mere sentiment, the discontent which we, thus affected, feel we shall not in the natural course of things have long to bear. If it brings as it will to those who come after us relief from the annoyances to which we have been subjected, I shall for one be quite content with what I have helped to bring about, though, as to most reformers, it has come in a shape we neither hoped for nor expected. But it may be said of us that we "builded better than we knew," and at least improved upon our heritage.

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Proportioning Cone Pulleys.

BY JOHN E. SWEET.

The ingenious and beautiful piece of graphic work for proportioning cone pulleys, shown in the "Machinist" of July 14, taken from Professor Palmer's pamphlet, and in which incidental reference is made to the writer's method, published in the "American Artisan" of February, 1874, leads me to reproduce that method in connection with so much of the work relating to this subject done at Cornell at about that time as I can call to mind.

I wish to say, however, that I am fully aware that the mathematician's methods are likely to be the more accurate and the mathematical description quite as readily understood by the man with a mathematical training as the draftsman's methods, hereafter shown; but I also believe that mechanics who have not been so educationally favored will understand the draftsman's methods and descriptions

the more readily. As to accuracy, a leather belt is such an elastic factor in the cone pulley problem that the variation of one-tenth of an inch in the diameter of the pulley, where the belt is of moderate length, is of little consequence.

Before entering into the discussion of the proper sizes to secure proper tensions and length of belt it may be well to describe a graphic method of determining whether a set of cones already made

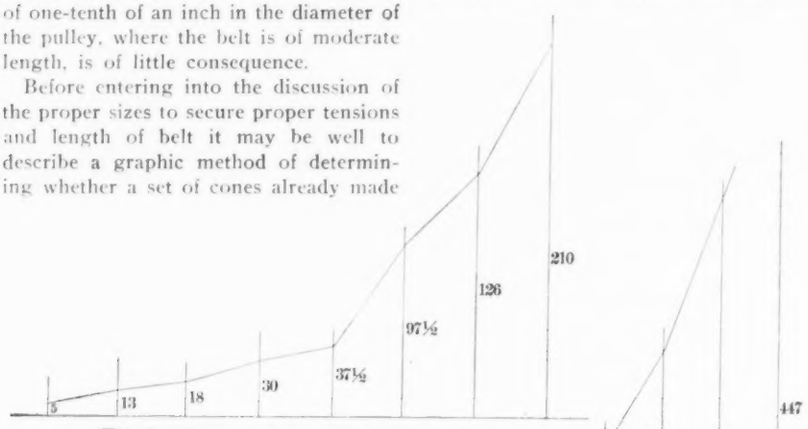

Fig. 1. Diagram showing badly proportioned Cone Pulley and Back Gear.

are well proportioned, and from that devise a method for designing new work.

In the case of the best lathes we had at Cornell in the early days, the speeds with the belt on the different steps, and with the back gear out and in, were counted and plotted as shown in Fig. 1, and for one not familiar with this method of representing speeds by lines it is only necessary to explain that the number of revolutions made in any fixed time, say one minute, or during any fixed number of revolutions of the countershaft, say 110, is represented by the same number of small distances on a line. There were four steps to the cone and a back gear, and eight vertical lines were drawn, as shown in Fig. 1. At the slowest speed with the back gear in it was found that the lathe made, say, five revolutions, or some such number, while the counter made 110, and on the first vertical line, at a scale of 20 to the inch, 5 20ths or ¼ inch was set off. At the next faster speed, perhaps thirteen revolutions, 13 20ths were set off, and so on until all the speeds were marked on the eight vertical lines, the fifth being 7½ times the first and the sixth 7½ times the second, etc., and with these measurements connected together such a diagram as Fig. 1 was produced. From this graphic illustration it was easy to see that the cones

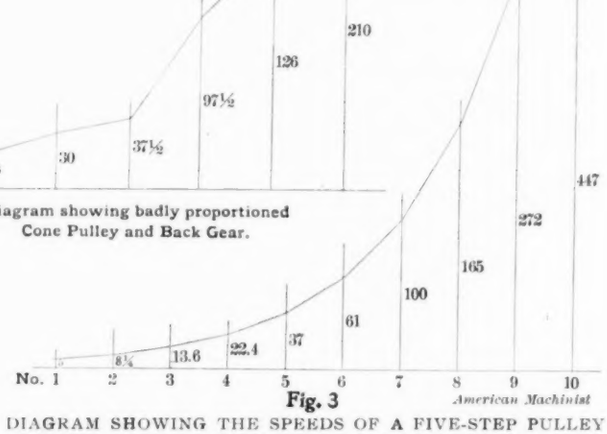

Fig. 3

DIAGRAM SHOWING THE SPEEDS OF A FIVE-STEP PULLEY AND BACK GEAR, WITH UNIFORM INCREASE OF SPEED.

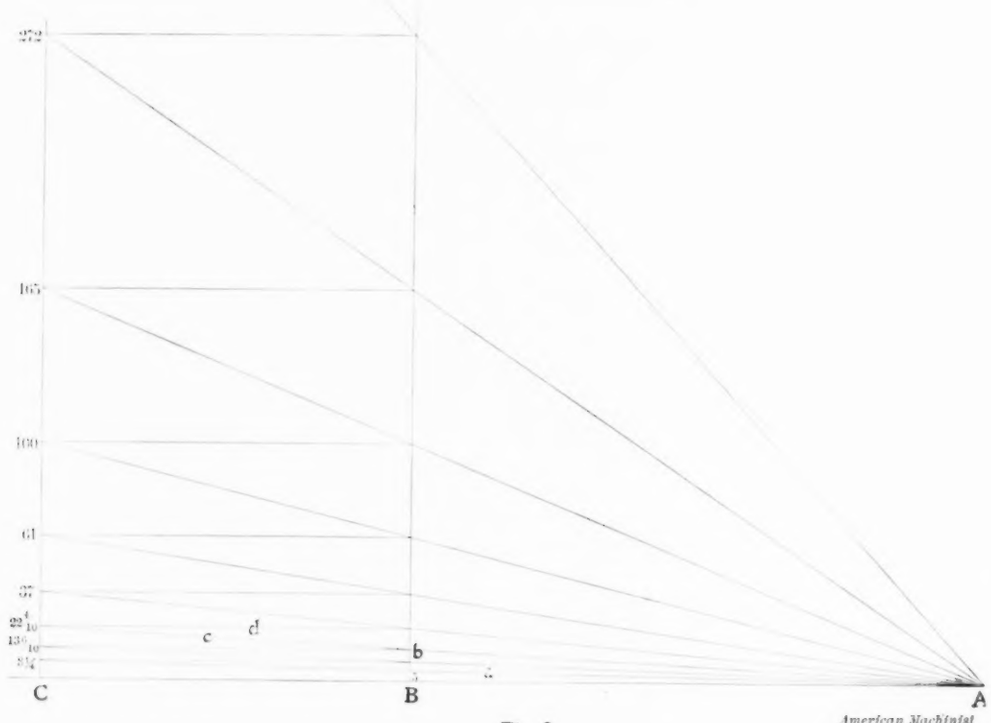

Fig. 2

DIAGRAM SHOWING A READY METHOD TO INCREASE OR DECREASE BY ANY FIXED PERCENTAGE.

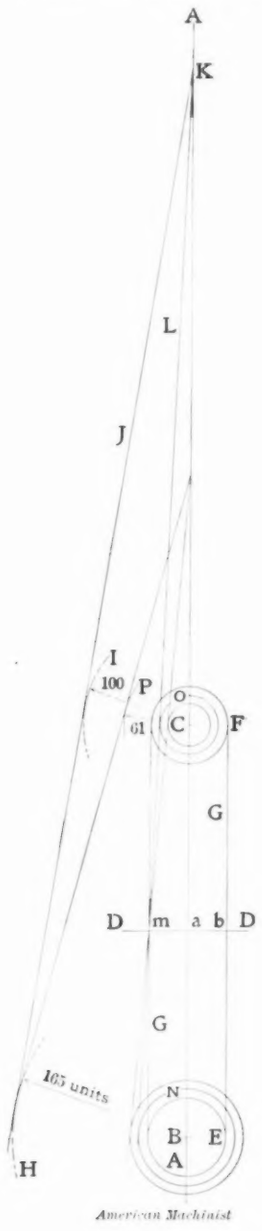

Fig. 4

METHOD OF PROPORTIONING CONE PULLEYS TO SECURE REQUIRED SPEED RATIO AND PROPER SIZE FOR BELT LENGTH.

and gears were not well proportioned, and it at once points out a good way to quickly determine what will be good proportions.

In a problem of this kind the designer must in some way determine what he wishes to do, and in the case of an ordinary lathe he must decide upon either the ratio of the back gear or the ratio of increase. With a ratio of increase of 75 per cent. from one speed to the next a four-step pulley will call for a back gear of about 9 1-3 to 1, while with a five-step pulley and a 64 to 65 per cent. increase the back gear will need to be about 12 to 1.

A simple graphic way of readily determining the speeds for a given ratio of

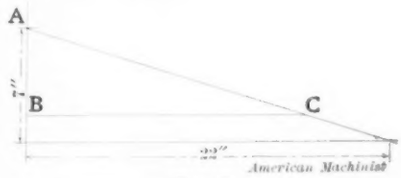

Fig. 5

DIAGRAM SHOWING QUICK WAY OF DETERMINING THE CIRCUMFERENCE OF CIRCLES.

increase or decrease is shown in Fig. 2. On a horizontal line fix a point as at *A*, and at any convenient distance set off 100 units, say 100 eighths of an inch, or 12½ inches from *A* to *B*, and draw at *B* a vertical. From *B* lay off *B C*, equal to *A B* times the assumed percentage, that is, if the percentage of increase in speed desired is 65, then make *B C* equal to 65 units or 12½ inches × .65 = 8⅛ inches, and draw the vertical at *C*.

For vertical measurements adopt any scale, say 40 to the inch. Start with any convenient number of revolutions, say 5, and lay off 5-40ths, or ⅛ inch, on *B*, and strike the diagonal *a*, then square back to *b*, and *B b* measured at the same scale of 40 to the inch will give the number of revolutions required for the second step, and from that point it is only necessary to draw another diagonal and another horizontal, as shown by *c* and *d*, and thus build up the speeds, each being 65 per cent. faster than the one below.

By this graphic method it is as easy to increase by any fractional percentage as it is by 50 or 100, whereas by arithmetic a fraction involves a lot of figures.

Having determined the varying speeds required, Fig. 3 shows a five-cone pulley plotted as in Fig. 1, and the value of No. 6—61— divided by that of No. 1—5— gives the relative speeds with back gear in and out, that is, $\frac{6}{15}$ or very nearly 12 to 1.

It is a quite common, if not the general practice in the case of ordinary lathes to make both countershaft and headstock cones from the same pattern, and in that case the two central pulleys would be the same diameter as shown in Fig. 4, and this leads to the important question of how to determine the size of the next pair of cones.

Taking the case shown in Fig. 3, the speed given for the middle pulley is 13.6 revolutions with back gear in and 165 with back gear out. If with the belt on the middle pulley the lathe runs 165 per minute, the counter must run the same, and assuming that to be the case, when the counter continues to run 165 the point to first determine is the size of the next steps to make the spindle run 100, the next slowest speed, as shown in Fig. 3, and yet have the belt fit equally tight.

As the lathe builder does not know how far the cones are to be apart, it is impossible to make them theoretically correct, but the angle of the belt is so slight in every case and the error so insignificant that whether the distance between pulleys is 4 or 14 feet, no one can tell in practice whether right or wrong.

Start the diagram Fig. 4 by laying off on the vertical line *A A*, at any convenient scale, the two centers *B* and *C* to represent the centers of the two cones, and half way between these draw the horizontal line *D D*. With *B* and *C* as centers strike to the same scale, the circle *E* and *F* representing the middle pulleys and the belt line *G*. As the lathe spindle is to run 100 while the counter runs 165, with *B* as a center, strike the arc *H* with a radius to any scale to represent 165

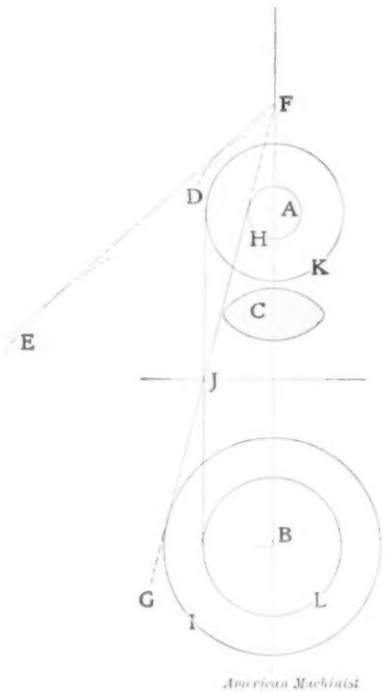

Fig. 6

PROPORTIONING CONE PULLEYS SO THE BELT WILL CLEAR AN IMPEDIMENT.

units, and the arc *I* to the same scale with radius of 100 units. Draw the line *J* tangent to these two arcs and extend it to *K*. Draw the line *L* through *K* so as to intersect the lines *G* and *D* at *M*. The circles *N* and *O* give the proper sizes for the pulleys, both to meet the condition of speed and belt length. The next sizes

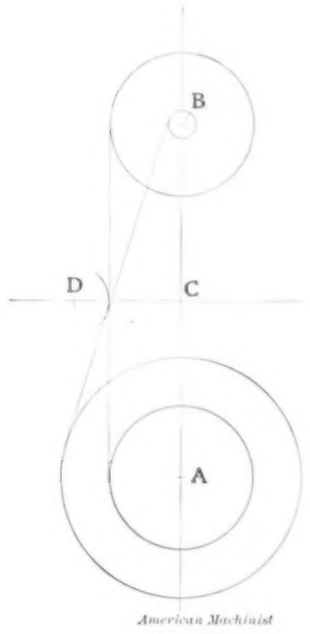

Fig. 8

SMITH AND COFFIN'S CORRECTED METHOD.

are determined in the same way, the arc *H* again representing the 165 revolutions made by the counter and the arc *I'* 61 revolutions required of the spindle.

To determine the length of the belt it is only necessary to double the distance between the centers *B* and *C* and add the circumference of a circle whose radius is *a b*. As tables of circumferences are so common it no longer seems necessary to do any figuring, but if one does not have the table, resorting to figures is not necessary, as a triangle as shown in Fig. 5 serves every purpose. Draw the horizontal and vertical lines, lay off 22 inches on the one and 7 inches on the other, and draw the diagonal. From the point *A* measure down at any convenient scale the diameter of the circle or pulley, say to *B*, and the distance from *B* to *C* will be the circumference of the circle on the same scale.

Assume a case such as may occur in the feed gear of some machine. Let the centers be 2 feet apart, with extreme speeds of 1 to 1 and 4 to 1, and suppose an impediment to exist as shown at *C* in Fig. 6, *A* being the center of the driving shaft and *B* the driven. It is evident that the 4 to 1 pulleys must be large enough so that the belt will clear the impediment, hence it is necessary to determine these sizes first. Proceed as in Fig. 4 by striking the arcs *D* and *E*, one with four times the radius of the other. Locate the point *F*, and from that the line *G*, so it will clear the impediment,

and that determines the two pulleys *H* and *I*, and the point *J* determines the size of the equal pulleys *K* and *L*, and the length of the belt, as in the case of Fig. 4. By this method the sizes necessary to escape the impediment are arrived at without experiment.

In the case of a crossed belt the method of procedure is very like that shown in Fig. 6, except in the method of locating the point *F*, which is shown in Fig. 7. Instead of drawing the line *M* tangent to the two arcs, as is shown in Fig. 6, it is drawn through two points on the lines *D* and *E*, they being set off, according to the ratio of speeds required, and the circles to represent the two pulleys *H* and *I* are not struck tangent to the line *G*, but to cut the points on the horizontal lines *D* and *E*, where the line *G* intersects.

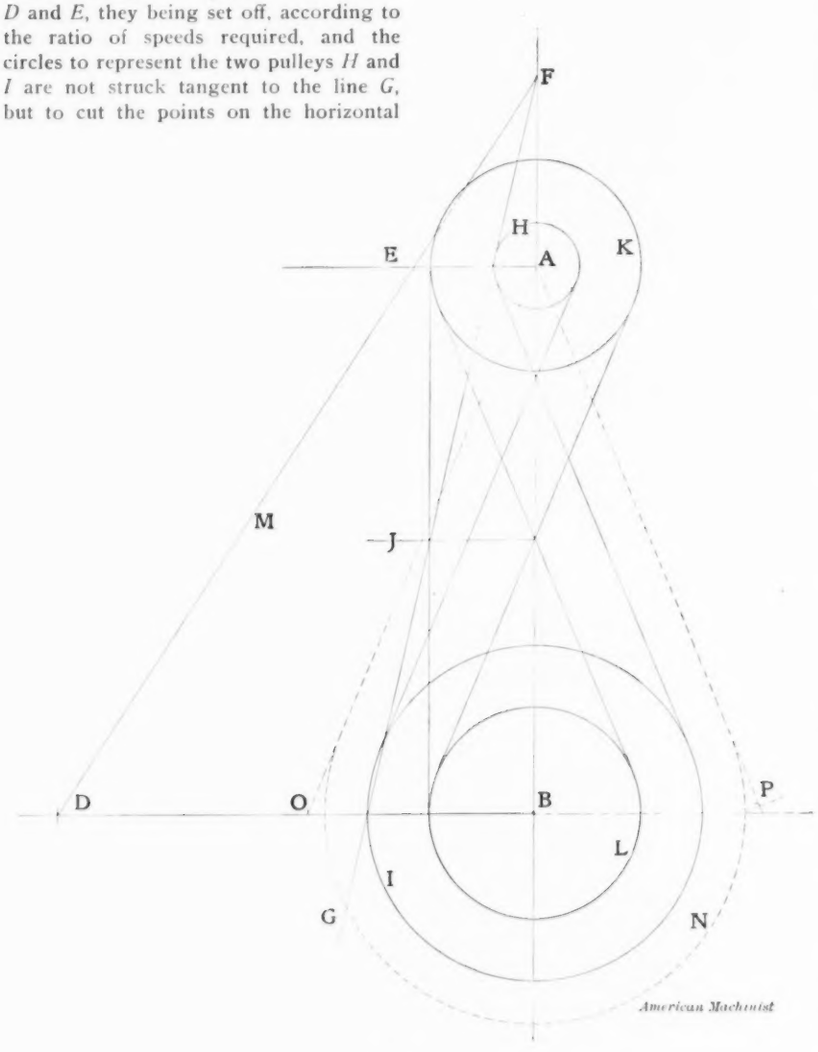

Fig. 7
DIAGRAM SAME AS FIG. 4, BUT FOR CROSSED BELT.

To determine the length of the belt it is only necessary to draw the circle *N*, which is equal in diameter to any pair of pulleys, and the length of the belt is very closely half the circumference of the circle *N* plus the distance from *O* to *A* and from *A* to *P*. So far as relates to a crossed belt, this system is as accurate as a draftsman can work, but in some cases some parts of the plans I have shown are not sufficiently accurate for practice, and this was first pointed out by C. A. Smith, as mentioned in your comments, and a means of correction devised, as published in the "Machinist" of February 25, 1882, which John Coffin improved upon, as shown in the "Machinist" April 1, 1882. The correction consists of striking a circle as shown in Fig. 8, to which the belt lines should be tangent. Mr. Coffin made the center of his circle from *C* to *D* equal to 304-1000ths of the distance between the two shaft centers *A* and *B*. Mr. Smith, in a paper before the American Society of Mechanical Engineers, read in 1888, advocated a distance of 314-1000ths. I doubt if one could work fine enough from lines, or find such workmen as are set to turning pulleys, to detect the difference. Probably 5-16ths, the distance between the centers of the shafts for the value of *C D*, would be as nearly correct as any other value. I refrained from introducing this feature in Figs. 4, 6 and 7, because in Fig. 7 it would be wrong, and in the other figures it would not in the small drawing show any appreciable difference, or in most cases make any difference; but when the belt runs at a considerable angle it is necessary to follow the corrected method.

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A Bezel Turning Tool.

BY A. H. CLEAVES.

The tool described in the following article was a design of my own, and was used for turning down the rim of a brass bezel for holding a glass over a paper dial in one of the old watch style of cyclometers. It gave such satisfaction that I can recommend it without hesitation for similar work in connection with any small manufacturing that may call for it. A girl easily kept ahead of the procession where we were getting out between four and five hundred cyclometers a day, and without using the tool all the time either.

In Fig. 1 *a* is the bezel ring, shown in black for plainness; *b* is the crystal, *c* a brass ring for the glass to rest on, and *d* the paper dial. The bezel had a hole in the center, being held by friction on a hub.

The roller *D* is shown here in position to commence rolling the thin edge of *a* down over the beveled edge of the glass. In Fig. 6 it will be seen that the lower front edge of the roll *D* coincides with the center of the shaft *B*, a principal feature, too.

Anyone attempting to turn this edge down with a roller held in the hand will find how easily the metal crimps and how hard it is to get the wrinkles out again. Then, the glass being put on the last thing, and varying in thickness, and the cyclometer being a drawn punching more or less irregular, the roll must meet the requirements of an uneven surface and wabbly movement; or be perfectly flexible in action, and this is just what it does.

The roller carrier, bearing *P* revolves at will in the frame plate *N*, which permits the roll *D* to follow any eccentric movement of the bezel as it turns; and any variation in the hight of the point *e*, Fig. 1, on different pieces of work is adjusted by the nut *M*, Fig. 4, while the machine is running. If I remember aright, after using the tool awhile the operator loosened the nut *u*, and any slight up and down movement of the work at *e*, caused by the same moving out of level, was compensated for in this way. Arbitrary conditions are out of place in this case, and would break the crystals rapidly, which hardly ever occurred as it was.

The chuck for holding the work contributed to facilitate things and is calculated to hold any work in the same line. The principal piece *E* is made of cast iron and the whole driven by power at the

pulley *R*. The revolutions per minute I have forgotten, though that can easily be found by experiment. A convenient shipper for the hand on the bench or a foot treadle shippers should be provided.

The shaft *E* rests on the hardened seat or ring *S*, which has two pins entering slots in *N*. These have sufficient up and down movement to admit of adjusting the

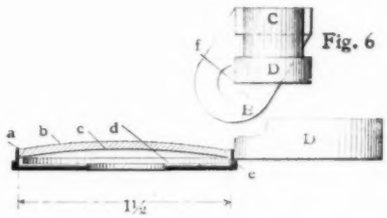

Fig. 1

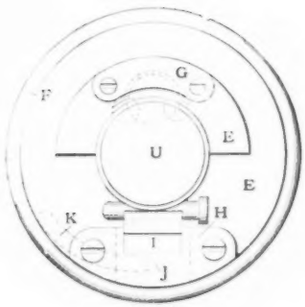

Fig. 2

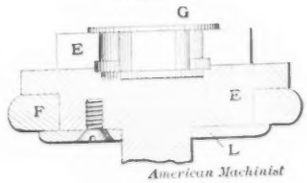

Fig. 3

THE WORK, AND THE CHUCK FOR HOLDING IT.

work, and being in the slots in *N* cannot turn with the spindle *E* and move the nut *M*. The vise jaw *I* slides in a sink in *E* and is carried forward and back by the slot *K* in the ring *F* (Figs. 2 and 4) working on the pin *J*, which is fast in *I*. The ring *F* is held in place by the plate *L* secured to *E*.

The cyclometer *U* is located centrally by the high part of *E* turned out and drilled out, and milled half off. *G* is a hold-down piece, and *I* has a V groove in it which catches the screw tube on the cyclometer.

H is a plate or cover for *I* to prevent the latter from lifting, and has a place cut out for *I* to move back in.

As the roller *D* rotates around the point *F* it finds any angle on the glass bevel and is accommodated to uneven features by the swivel post *P*. *Q* explains itself as a locating collar for *B*.

Chicago, Ill.

German Workingmen's Insurance.

The American consul at Chemnitz gives some account of the German workingmen's insurance system and its workings:

"The object of the system is to alleviate the sufferings of workmen and their families: (1) In cases of sickness (sick insurance); (2) in cases of accidents incurred at work (accident insurance); (3) in cases of feebleness, wasting diseases, decreased capacity to work and old age (invalid and old age insurance).

"In cases coming under No. 1 there is given free medical treatment; sick money—that is, money during period of sickness with which to obtain medicine, nourishment, etc.—or, if desired, free treatment in a hospital and support for the family, and money, in case of death, is supplied the family. The fund is furnished by employers and employed—the former paying one-third, the latter two-thirds.

"In cases of accident insurance the parties receive support during convalescence, from the fourteenth week after the accident happens. Money is given the wounded person from the fifth week. Benefits are paid from the first day of the fourteenth week after the accident. The benefits amount to two-thirds, and in some cases to three-fifths, of the workman's yearly salary.

"The fund for burial expenses is furnished by the employers. In cases coming under invalid and old age insurance, the parties receive benefits from the time they are unable to work, without regard to age; old age benefits, from the seventieth year, even if they can work and do not draw invalid benefits, and assistance against disease, so as to prevent incapacity. In case of his death or marriage, the full sum paid by the party is returned.

"The amounts shown in the table, page 762, were paid out in one year.

"During the years from 1885 to 1897 employers had paid in 1,337,741,176 marks ($318,382,399), and workmen 1,173,449,805 marks ($279,281,053), a total of 2,511,190,981 marks ($597,663,452). Of this

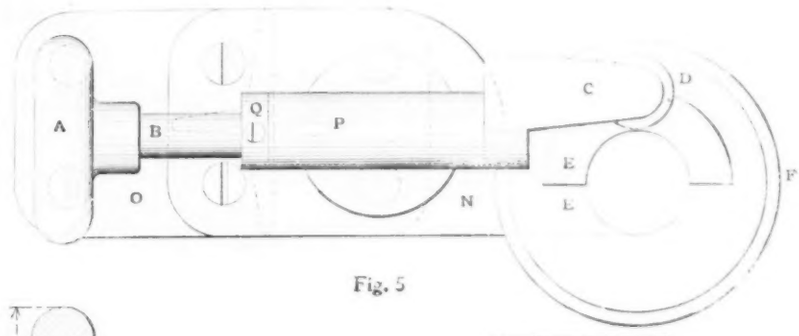

Fig. 5

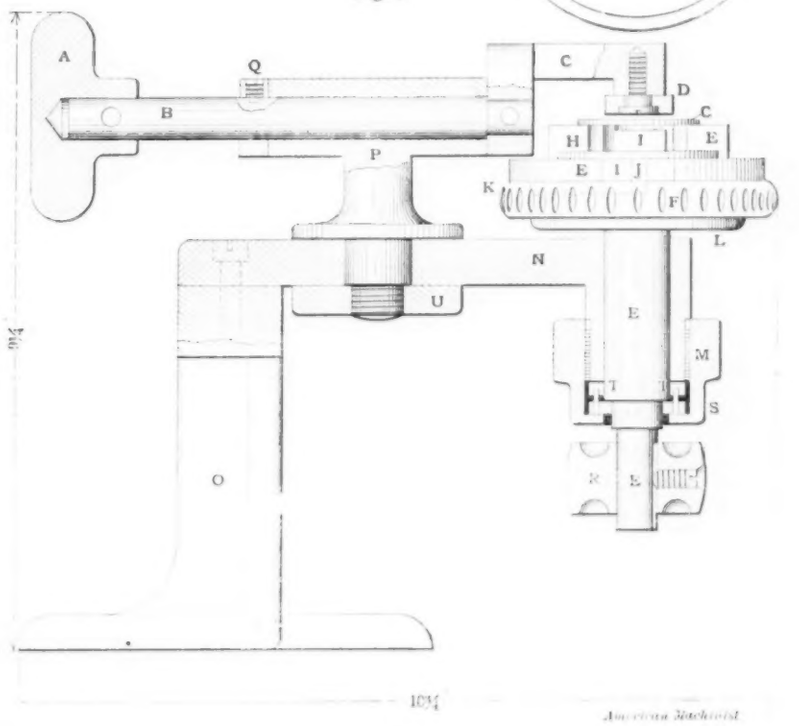

Fig. 4

A BEZEL-TURNING TOOL.

Year.	Sick Insurance.	Accident Insurance.	Invalid and Old Age Insurance.
1885-86.....	$23,905,005	$460,625	.....
1887.....	13,138,009	1,412,030	.....
1888.....	14,651,637	2,304,173	.....
1889.....	16,892,097	3,442,503	.....
1890.....	20,013,429	4,835,041	.....
1891.....	21,243,594	6,289,483	$3,643,089
1892.....	22,433,499	7,696,957	5,344,742
1893.....	24,269,264	9,082,984	6,700,509
1894.....	23,702,063	10,589,044	8,332,475
1895.....	24,947,731	11,929,940	10,221,647
1896.....	26,114,926	13,602,747	12,293,533
1897.....	26,307,417	15,252,301	14,161,000
Total.....	$257,517,856	$86,847,842	$80,696,997

amount 1,702,184,100 marks ($405,121,816) have been paid out. Thus the workmen have already received 528,700,000 marks ($125,830,600) more than they have paid. For every twentieth person of the empire's population one has been paid insurance. Whether a system which makes so much for paternalism is one to commend, I cannot say. Its effects here have been anything but bad. Poverty, in spite of poor wages, is practically unknown."

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The American Side-Wheel Steamboat and Its Engine.

A piece of American engineering which has never received the attention in the engineering press that it deserves is the side-wheel steamboat so common on our inland waters. These boats have many features which are unknown elsewhere, while the beam engine, with its Stevens valve gear, is more distinctly an American type of engine than any other, except the Corliss. While it is to-day a little passé, its long term of service is sufficient demonstration of its merits and justification of its preservation in engineering records.

With real satisfaction, therefore, we note that the "Engineer," of London, begins with its issue of September 23 a series of articles under the title, "American Paddle Wheel Steamers with Beam Engines," which is intended to fill the gap existing in technical literature. The subject is apparently to be treated with the exhaustive thoroughness characteristic of our English cousins—a conclusion which is indicated by the fact that the author has spent two years in collecting drawings, photographs, historical data and other information comprising his material, and the first article indicates that the series will be of decided interest to all American engineers.

We append some editorial comments, made by our contemporary as an introduction to the series, which indicate the appreciative spirit in which the subject has been approached—a spirit which, as our readers well know, is not always present in "The Engineer's" pages, and which it gives us the greater satisfaction to note and recognize on that account. This note is certainly as graceful a compliment by an engineer of one nationality to the work of those of another as we have ever seen:

"The American paddle wheel steamship is one of the most remarkable mechanical structures in the world. It has been invested from the earliest years of its existence with a certain glamor of romance, and the Mississippi race is a familiar episode in United States literature. Most of this racing, however, took place not on Western but Eastern waters. At a period when luxury was almost unknown in America there sprang into existence a number of floating hotels, the fittings and decorations of which could only be paralleled in the royal palaces of Europe, and these great structures were propelled at velocities quite unknown in any other type of ship by the largest steam engines in the world. As far back as 1828, that is to say, seventy years ago, the De Witt Clinton had a cylinder 66 inches in diameter, with a piston stroke of 10 feet, and a piston speed of 580 feet per minute. In 1849 the New World had an engine with a cylinder 76 inches diameter and 15 foot stroke, and 540 feet piston speed. Coming down to later times we find engines still the largest in the world. The Bristol, built in 1867, has a single cylinder 110 inches in diameter by 12 foot stroke, and the Puritan has a compound engine, the high pressure cylinder of which is 75 inches diameter and 9 foot stroke, while the low pressure cylinder is 110 inches in diameter by 14 foot stroke, and a piston speed of 616 feet per minute. We have long felt that a detailed description of these wonderful vessels would interest a large number of our readers. One of our own correspondents in the United States has for the past two years been collecting the requisite information—a task of most exceeding difficulty. We have no little pleasure in saying that he has at last succeeded, and we give this week the first of a series of papers from his pen, which will, we think, fill the gap which has hitherto existed in our technical literature, and we avail ourselves of this opportunity to express our thanks to a large number of engineers and shipbuilders at the other side of the Atlantic who have placed at our correspondent's disposal for use in 'The Engineer' photographs and drawings, lacking which any description of the American paddle wheel steamer must be incomplete."

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The Patent Office.

It will be remembered that when the Commissioner of Patents appeared before the Committee on Appropriations during the early part of the present year and asked for an appropriation for an increased working force he was met with the statement that it did not matter how much the examining force was augmented there would be no difference in the work accomplished. This was combated by the Commissioner, who promised satisfactory results if allowed an increased force. An appropriation of $62,880 was finally allowed, and provision was made for the appointment of eighteen additional examiners and assistant examiners and a number of clerks and copyists. That this action was a wise one is shown by a statement just issued as to the condition of the work of the Patent Office. There are at this time exactly 2,896 less applications awaiting action than there were before the additional force was authorized by Congress. In speaking of the matter Commissioner Duell said that the work thus far accomplished demonstrated better than any argument what the increased force has done. The greatest harmony prevails in the office, and the work is rapidly being brought up. Examiners who were months behind in their work are beginning to see the end, and the Commissioner promises by July 1 to have the Patent Office in such shape that an inventor filing his application for patent can expect and will receive an action thereon within six weeks, and as time goes on that time limit will be reduced until the office is working on a prompt basis. That is what the augmented force has made possible, and inventors throughout the country will rejoice at the new order of things. A. F. T.

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Finishing Valve Faces and Ports at Horwich.

The method of finishing the valve faces and of milling the ports in locomotive cylinders at the Horwich shops of the Lancashire & Yorkshire Railway evidently differs somewhat from my description of it as given in our issue of September 8. I was under the impression that a machine not shown in the illustrations was used for milling the valve faces and ports, but Mr. Aspinall, in a letter referring to the article, informs me that the machines shown in that issue really do all the work; that the valve faces are planed at the same time the other planing is done, and the ports milled in the drilling machine by laying a template over the face to guide the cutter which is held in the drill spindle. He states that there is very little iron to remove from the ports, as the castings come very close to the finished size. F. J. M.

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In England they are beginning to stir for decimal coinage. Better late than never.

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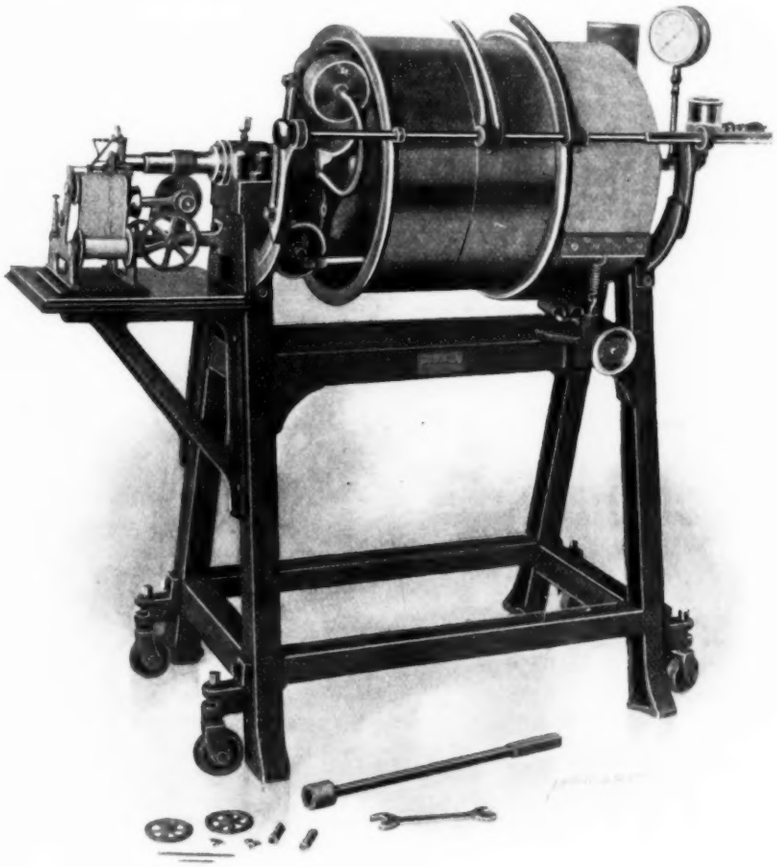
It is announced that the sixth general meeting of the Society of Naval Architects and Marine Engineers will take place in New York city Thursday and Friday, November 9 and 10, at the house of the American Society of Mechanical Engineers, 12 West Thirty-first street.

A Combination Absorption and Transmission Dynamometer for Laboratory Purposes.*

In this paper Professor Flather describes some recent improvements in his hydraulic transmission dynamometer, the most notable feature being the employment of a water cooled pulley and a perforated rim which permits the use of a brake band that can be used for absorbing the power furnished to the machine. The fixed pulley which is ordinarily used to connect the dynamometer to the machine to be driven has internal flanges for carrying the cooling water, and the rim is furnished with a number of brass bushings drilled through endwise, and provided with a regulating screw by which the amount of water admitted to the brake band is readily controlled. The brake band is a three-ply cotton belt 7 inches wide, connected through two sets of tension springs to the brake regulating screw.



COMBINED ABSORPTION AND TRANSMISSION DYNAMOMETER.

It will be readily understood that the brake band may be quickly removed, thus converting the machine into a regular transmission dynamometer. In either case an automatic record is obtained on a roll of paper which is caused to pass with uniform motion under an indicator pencil that records variations of pressure.

In addition to the force curve traced by the indicator pencil the zero or datum line is traced by another pencil which is adjustable in position, and may be located at pleasure on a line parallel with the axis of the shaft. Thus one is enabled to measure the total power required to run a given machine or any subdivided part of it. The two cylinders through which the driving power is transmitted are each 10 square inches in area, and are provided with bronze pistons actuated by plunger pins, which may be located in either of two positions—the inner for ordinary work and the outer for extra heavy work, say, when it is required to measure 20 horse-power, or when the speed of rotation is very slow.

It will be understood that springs of varying degrees of intensity may be used to transmit the pressure from shaft to indicator pencil. These springs are changed as in any ordinary indicator.

The work of friction of the plunger in the cylinder is practically eliminated since the combined area of the plungers is so much greater than in the indicator piston, and since the indicator motion multiplies the distance moved by the indicator piston five times, it will be seen that the motion of the plungers is exceedingly small. The more recent machines are provided with adjustable casters, which permit the weight of the dynamometer to be carried by wheels or to rest firmly on the floor, as desired. This will be readily understood by reference to the half-tone illustration.

* Abstract of a paper read at the Boston meeting of the American Association for the Advancement of Science by Prof. J. J. Flather.

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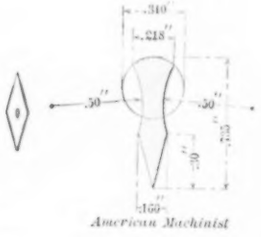
Admiral Dewey's Sword.

The blade and scabbard of "our Dewey's" sword are in the hands of the workmen at the Springfield Armory. The blade will be of the finest quality of sword steel, with such a finish as has probably never before been equaled in the manufacture of a blade. The scabbard will also be of thin sheet steel, with a joint made up of a series of "dove-



tails," about 3/8 of an inch in width, reaching the entire length of it. The famous firm of Tiffany & Co., of New York, will perform all the work of finishing, and probably the scabbard, with its many decorations, will never show any resemblance to steel; neither will any of the work of the mechanics in the United States Armory be in evidence after it comes from the craftsman employed by Tiffany, covered, as it will be, with gold and silver.

The principal dimensions of the sword are:

Length of blade	30.375 inches
Width of blade at hilt	.75 inch
Thickness of blade at hilt	.232 inch
Length of handle	6 inches

The section of the sword, shown exact size, is taken 10 inches from the hilt. The end is double edged up to 10 inches from the point.

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It is announced that Mr. William J. Clark, of the General Electric Company, is about to publish a book entitled "Commercial Cuba." It is designed for business men who may wish information regarding the business prospects and proper methods of doing business in Cuba, and is written by one who is thoroughly competent for the work. It has an introduction by our contributor Mr. E. Sherman Gould, who has spent considerable time in Cuba in engineering work.

Letters from Practical Men.

Breaking of Pig Iron.

Editor American Machinist:

In these days when facilities for turning out work, and simplicity of construction are so much considered, I am inclined to believe that an improvement might be obtained in our pig iron. At present the shape of it is very inconvenient, especially to those whose cupolas are not of sufficient capacity for them to have a man to devote his whole attention to the breaking of it. Some firms have got up devices for breaking pigs. I have seen two or three; one I remember where a weight was pulled up and held by a trip, and when released sometimes breaking the iron at the first blow, and then again often requiring several drops. The time consumed seems never to have been considered. True, it is generally a laborer who is employed, but, even so, it is hard on the man and an additional expense to the firm.

I believe it would be much easier and save much worry if some enterprising firm would devise a way to change the present shape of pig iron, which has been in use, I believe, for the past half century or longer. I would recommend the form of babbitt metal, leaving the indent sufficiently strong to still avoid breakage in handling.

One can readily imagine if made so how easily it might be broken for use, and what a saving of labor it would effect. It would only take about half an hour's time of the laborer to do what now takes him a day or more, and would permit his attention to be devoted to other work.

THOS. BRENNAN, JR.

Louisville, Ky.

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Editor American Machinist:

In answer to your correspondent, who suggests that it would be a great saving of labor and much more convenient for foundrymen if pig iron was supplied with nicks at intervals, enabling the pigs to be more easily broken and yet strong enough to stand ordinary handling, I would offer the following reasons why pig iron is not so made: There are few furnace men, let alone founders, who would not much prefer to have pigs more readily broken than they are, and, were it practical, the furnace men would be as eager to attain this end as the founder. The greatest difficulty in making deeper notches in pig metal lies in the probability of the sand being washed away by the seething metal as it rushes down the runners into the sows to fill the pig bed molds. A very small number of our molders or founders have ever witnessed the molding of pig beds, and hence those who have not are at a loss to understand why the notches could not be made deeper, as they know could readily be done in ordinary foundry practice. If such founders will take into consideration that the sand used at blast furnaces for molding pig beds is very sharp and coarse, similar to coarse bank or lake sand, and that three men will mold up or "bed in" a cast of pigs, which may number from 600 to 1,000, in one to two hours, they will be in a position to understand the impracticability of forming deeper notches. Some may wonder why blast furnaces use such coarse, gravely sand, instead of the loamy sand, generally employed in foundries. The reason is in the great risk of having "blow-ups," due to the sand not permitting the free escape of steam or gases, especially should their sand not be well mixed or of right "temper." Then, again, it would take exceptionally skilled molders to cover the floor of a casting bed with pigs molded in the ordinary foundry sand, a fact which will be seen when it is stated that the space in casting houses will not permit much over 3 inches of space between the pigs. As the work of molding pigs is of a routine and rough character, good molders could not be found to engage in such work.

I am well aware of the importance of the suggestion, and there are a large number of founders at the present day that are asking similiar questions or making inquiries of furnaces if they could not increase the depth of notch in pigs. This is brought about by competition. It is not many years back that the question of depth of notches had but little weight, as then furnace men had good margin of profits, and the cost of breaking the pig was rarely considered. Since competition had driven furnace men to such close figuring, the cost of breaking iron before loading is seriously considered, but the furnace man will endeavor to get out of it if he can saddle this expense upon the founder.

As quite an odd coincidence, our own firm is at this time bartering with furnace men on this point, trying to close deals for pig iron, so that I should be in a good position to realize the import of your correspondent's suggestion. The casting of pigs in chills or iron molds is a new departure that is going to greatly remove the objections many founders find to the labor and expense of breaking long pig metal, as chill cast pigs are by present appliances molded in forms of about half the length of our present pig metal, and would thus be more like the form of the babbitt pig metal desired by your correspondent. Aside from the fact of chill cast pig being about half the length of our present sand pig, it has also the advantage of saving fuel and giving cleaner melted iron from the cupola. Several furnaces have adopted this new method of chilled pig casting. The economical advantages attending its manufacture and use in preference to sand cast pig metal, I believe, will soon cause most furnaces to abandon sand molds. The sooner this day comes the better it will be for all concerned. THOS. D. WEST.

Sharpsville, Pa.

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A Machine Works with Rural Surroundings.

Editor American Machinist:

I was one of the fellows who in the end of summer was able to step out of the harness a couple of weeks, after the fashion favored by the "American Machinist" and other civilized and up-to-date people. I wandered for the most part far away from the shops and the noise and the dirt; not that noise and dirt are the only appurtenances of the shop, but that is a cheerful way of putting it under the circumstances. It happened, however, that one day in the course of my wanderings I found myself in Bennington, Vt.

Probably not one reader of the "American Machinist" could say, on the spur of the moment, what is the most prominent fact which connects Bennington with the great world. I am inclined to think that it is that here is located an establishment whose specialty is wood pulp machinery. Mr. Olin Scott, the proprietor, an old-time contributor to the columns of the "American Machinist," claims that he builds more of this class of machinery than any other concern in the world. Wood pulp means cheap paper, "yellow" journalism and books that perish, forest destruction and other interesting things. Mr. Scott is one of the exporters of American machinery. The wood pulp machines go to Sweden and Norway and elsewhere in Europe, and they are chewing up the forests of Newfoundland. The wood pulp people make landings on the coast of Newfoundland in the style of the landing of the Pilgrims on the New England shore, only that there are not even Indians to welcome (or otherwise) the modern expeditions. The men and all supplies and equipments are landed and the work of destruction is soon inaugurated, to be carried on until the island is stripped, which, however, will take some time. Mr. Scott has accompanied more than one of these expeditions, either to Newfoundland or to European points.

Mr. Scott's environment is apparently in many respects an ideal one, although the ideal is not of the most modern development. He has been in Bennington forty years, and he and his surroundings have grown to each other. He is on his own ground and is monarch of all he surveys. His office is next to his residence, the foundry is beyond the office and the flask storage is across the creek from which he gets power to drive the whole. The blacksmith shop is across the street from the office, and beyond that

and opposite the residence is the machine shop, with the carpenter shop in the farther end of it. All are isolated buildings, and there is no spot from which any satisfactory view of the whole can be had. I took a snap shot from the best position I could select, but the view shows more of a village street and trees than of anything else. There is on the property a three-story factory building which is let to other parties, and the power for which is supplied by a water wheel that takes its water from flowing springs in the neighborhood, clear and sparkling and cool the stream still is after it has done its work.

The wood pulp machinery requires no special mention. It is just average machinery, built in the old-fashioned way. Mr Scott has other specialties of manufacture besides this. He makes 10-foot poles and other measuring rods. One of these rods is for measuring cord wood, and the idea of it, which I believe is Mr. Scott's own, is not bad. You know that to measure a pile of cord wood you have

A COUNTRY MACHINE WORKS.

to measure its hight, width and length, each in feet and inches, multiply them together and divide by 128. Anybody can do it, of course, give him time enough, but not many enjoy it if there is much of it to do. Mr. Scott's rod is made of a length equal to one side of a cube which contains 128 cubic feet, which is 5.0397 feet, or very slightly over 5 feet 3/8 inch. The entire length of the rod is divided into ten equal divisions, and these are each subdivided into ten, so that the hundredths divisions run the whole length of the rod. In using the rod to measure a pile of wood the three dimensions of the pile are taken by the rod in whole lengths and hundredths; the three measures are multiplied together and the work is done. You don't have any inches to bother with and you don't have any dividing to do. Say that you have a pile of wood or bark or whatever it may be that measures .81 × 1.21 × 3.45: there it is all stated ready for multiplication, and when that is done everything is done:

$$.81 \times 1.21 \times 3.45 = 3.38 \text{ cords.}$$

Doing this by feet and inches measurement this would be, taking the nearest inches:

$$4' 1'' \times 6' 1'' \times 17' 5'' \div 128 = ?$$

Anybody is welcome to work it out who wants to.

Mr. Scott is quite interested in the public schools of the village and in educational matters in general, and is fond of furnishing problems of various caliber for the scholars. One of his pet playthings that he showed me was a neat cube with a side of about 2 inches, and composed of an inclosed tetrahedron and the four corner pieces that complete the cube. This is one of the curious things that elementary geometry brings to our knowledge, and gives opportunity for quite a range of computations. It may be worth while if we have time to talk about this a little in another letter, as this one is long enough. The number of readers of almost anything that is written or printed is inversely as the square of the length of it. TECUMSEH SWIFT.

▲ ▲ ▲

Drill Sockets for Taper Shank Drills.

Editor American Machinist:

The criticism of my articles on drill sockets by "Drillman" seems to call for a reply.

If "Drillman" will read those articles over a little more carefully I think he will find answer to part of his remarks.

Sockets and drills fitted perfectly will drive, as he says, in *clean, solid* stock.

Mr. Editor, how many are fitted that way? If they were so fitted how long would they retain that kind of a fit under the usual methods of use?

In my experience as toolmaker I have had to meet conditions as I found them, and the conditions that are perfect are usually out of reach. Making the tongue enter the slot farther does not prevent the tongue from twisting, but it does prevent the corners of the slot from getting rounded off. If the strain is too great the tongue will be twisted clear off without injury to the socket, and a tongue twisted clear off is just as useful as a tongue twisted half way round, and a socket with square corners at the tongue hold is far superior to one with corners rounded off.

Those five standards seem to be the worst thing that our friend "Drillman" sees. The time given is the time in the toolroom. The time cutting off stock and the smith's time is not accounted for. The lathesman turned those standards up and knurled the handles in six and a half hours. The grinder man lapped the centers after hardening, so they would give no trouble while grinding, and his time lapping centers and grinding was a little less than twelve hours. And although I do not claim nor expect that they are perfect, they are so good that I will not be ashamed to show them to anyone (even "Drillman"), and let anyone who can do it properly measure them up.

We read in the "American Machinist" that the most successful mechanic is the one who stops when his job is as good as it needs to be for the purpose intended; not the one who still works at it because he thinks it may be a little out here or a little out there, and after he gets through with his extra work cannot conscientiously say that it is better than it was before. As a case in point see the experience of Mr. Collins with the two racks, in the "American Machinist" of August 18, page 31.

Our tools for testing were B. & S. micrometers. We had nothing better, and don't consider that anything better for the purpose was necessary in the case of these gages.

As to my method of truing, it may not be perfection, but the sockets made in this way run true even when three or four sockets are strung together in the drill press, which is something that I've been unable to make the commercial sockets do.

Some manufacturers make sockets on the screw machine. I suppose these can be bought for $1.44. What kind of a test bar would they use on the screw machine?

Now as to the fellow at the vise with the drifts. He simply removes most of the stock between the holes, using several sizes of drifts and not taking out all the drill marks; then rough filing and finishing with a smooth file, as described. We use rather a large center with the clearance hole in *center* of the center, and as the sockets were true outside before "Bill rushed the tapers," the centers stayed so near the center of the work that we've had no trouble with the sockets running out.

As to the life of the sockets, I can say from experience that it is more than double that of the commercial sockets. I still hold to my previous statement that making drill sockets in an ordinary toolroom is not a job to be dreaded.

CHARLES W. WRIGHT.

[We fear that Mr. Wright and "Drillman" are not talking of the same thing when they refer to commercial sockets. There is a great difference in them. Some are accurate enough and good enough for all practical purposes, while others are not, but are only cheap.—ED.]

▲ ▲ ▲

More Trouble With the Horse-Power.

Editor American Machinist:

For some time past I have considered the study of horse-powers a rather dry subject, but the letters of Tecumseh Swift and of Elwood Haynes have revived interest in the matter. There are some things in Mr. Haynes' letter of September 15 that are not quite clear, and other things suggested by it call for some explanation. He says: "The horse is not entitled to any credit on account of propelling himself," and yet, in the

same letter, he shows us how it is possible for a man to develop 1¼ horse-power for a short time by going upstairs. Why is it that the horse is not entitled to any credit for propelling himself, while the man is entitled to credit for doing exactly the same thing?

Suppose that a horse weighing 1,100 pounds, without a wagon or any load but his own body, travels 1,500 feet in a minute over a road that rises 1 foot in 15, so that at the end of the 1,500 feet he is 100 feet higher up than he was at the start. It appears to me as if he had developed $1{,}100 \times 100 = 110{,}000$ foot pounds, or 3 1-3 horse-power, in going up the hill, and this represents the brake horse-power, to which we must add the friction of the horse himself, in order to get the total, or indicated horse-power, and yet Mr. H. tells us that he is not entitled to any credit for this, but only for the load that he may draw after him. If this is correct, in order to make the argument of Mr. H. consistent he should claim that the man is not entitled to any credit for propelling himself upstairs, but if he carries a weight in his hands he should be given credit for the power developed in raising the weight, and no more.

Again, he estimates that two persons and a carriage weigh 600 pounds, and that this is all that the horse has to carry, or propel, over the road, while in the case of the motor wagon he counts in the weight of the motor itself. If the latter is correct, then the weight propelled by the horse that weighs 1,100 pounds is $1{,}100 + 300 + 300 = 1{,}700$ pounds, while the motor must propel only 914 pounds. If this reasoning is not correct I hope to have its inconsistency pointed out.

Mr. H. says: "Sometimes mere strain at slow speed will answer in the place of the same strain at high speed. In this case it may not be necessary to increase the power to meet the emergency, but simply to decrease the speed." I take it for granted that by "strain" he means "stress," and wish to point out the fact that in the case he alludes to no increase of power is called for, but, on the contrary, the power is much less; therefore it is not necessary to provide for greater power at places where the road is bad, so that the motor carriage must go slow as much less power is called for. If this is correct it simplifies the problem of motor propulsion in a marked degree, as the maximum power is called for where the roads are good and the speed high, and of course the time when the minimum is called for can take care of itself.

While thinking of this matter independently of anything that I have seen in print, I have wondered if a very common statement is strictly true. If I ask why a 30 horse-power motor is put on a street car, the reply is: "Because it takes much more power to start the car than it does to keep it in motion after the full speed is attained." For the purpose of illustration, I assume that a steam engine is adopted as the motive power because the power developed by it can be more easily calculated. Suppose, then, that a 7x12-inch engine is used, and that the boiler pressure is 85 pounds by the gage, giving an initial pressure of 80 pounds, cutting off at one-quarter stroke, thus providing a mean effective pressure of 40 pounds, and at its highest speed the crank shaft revolves 300 times per minute. Under these conditions the power is $38 \times 40 \times 600 \div 33{,}000 = 28$ horse-power.

The popular belief seems to be that the greatest power is called for when the car or wagon is first started from a state of rest; therefore I assume that the crank shaft is making 10 revolutions per minute. The mean effective pressure is now nearly equal to the boiler pressure, or say 75 pounds, as there is no cut-off. The power developed is now $38 \times 75 \times 20 \div 33{,}000 = 1.7$ horse-power. This is the maximum amount of power that can be developed by this engine under these conditions, and it is certainly well within the limits of the strength of a pair of ordinary good horses; therefore I wish to ask where the 28 horse-power is ever used in starting the car?

W. H. WAKEMAN.

New Haven, Conn.

▲ ▲ ▲

Cylinder Oil as Belt Dressing.

Editor American Machinist:

About three years ago my assistant in charge of the blacksmith shop called my attention to the belt driving the blower and exhaust fan. He thought that by careful handling it might be made to last through the session, but would certainly have to be replaced at the opening of college the following year.

It was a 6-inch belt, and on examination I found it apparently worthless. It was so rotten that it would not hold belt hooks, and the holes for lacing had to be punched an inch and a half or two inches from the end in order to hold at all. The leather felt hard and dead, and on making a short bend it showed full of cracks. The load it was carrying was less than half what a 6-inch belt should carry under the same conditions; yet it gave constant trouble by slipping.

I picked up an oil can and poured a small stream of cylinder oil on the pulley over which the belt was running for two or three minutes. Altogether, I suppose, about as much as four or five tablespoonfuls was applied at that time. The effect was magical. The belt immediately picked up the load and carried it with ease. Furthermore, it is still carrying it, and so far as I know has not been cut since the first cylinder oil was applied. It is now quite loose, but gives no trouble by slipping. A small quantity of the oil has been applied at intervals of about six weeks during the time the blacksmith shop is in use. The belt appears to be in much better condition now than it was three years ago, when the first oil was applied.

The results were so satisfactory in this case that I have tried the same remedy in other cases, and always with the most satisfactory results. With the small amount of cylinder oil used I have been unable to detect the slightest injury to any of the belts. The amount need not exceed a tablespoonful of oil to 4 or 5 square feet of belt, applied to the pulley or belt while in motion to secure uniform distribution. It is not usually necessary to make the applications oftener than once a month.

It might be well to state here that our belts are not worked very hard, as we only run about six hours a day for nine months in the year. I do not wish to be understood as recommending cylinder oil as a substitute for belt dressing in every case, but simply offer the above as a bit of personal experience obtained under conditions somewhat peculiar.

Doubtless some of your readers have had experience along the same line that they would share with us, and perhaps others would be willing to try experiments under more exacting conditions and report results. JOHN J. WILMORE.

Alabama Polytechnic Institute,
Auburn, Ala.

▲ ▲ ▲

Making Allowances for the Molder.

Editor American Machinist:

I have long intended writing you a word, but as I am getting old and careless I have delayed longer than I ought to. I have noticed from time to time opinions expressed by machinists about our molders. Now, Mr. Editor, I have worked all over the States and I find that the same warlike feeling exists in all quarters. I, like a good many other machinists, have raised sand with the molder's shortcomings, but as I grow older and get more sense I ask myself "Is he to blame?" Considering all things, does he not deserve more credit than we machinists? I am sorry, but I believe that he does. Does it ever occur to you that his work is hidden, while ours is before our eyes? He is always in the dark, for he never is certain of his work until the casting is finished. His mold once closed he can only watch and wait; if he is successful he receives no praise, but if the casting is faulty some fellow in our end can sneeringly point out the trouble.

Now, the molder never tries to instruct us. I suppose that he thinks that he does well to attend to his own trou-

bles. A molder will have drop-outs because of soft ramming; but is he any worse than the man who breaks a drill from hard feeding? A molder will make a casting scab from hard ramming and poor venting. Is he worse than the fellow who clamps a pulley in the lathe by its arms and bores it out of true? A molder may pour a casting so hard as to strain it out of shape; yet I once saw a fellow bolt a cylinder down in a lathe so hard that when bored out it was not round. A molder may not put on a good skim gate and a machinist may plane up brass boxes out of square. A molder may set a core out of the center and a machinist may make a shrink fit so large that it sticks. A molder may not close his flask true; some machinists do not know that an eccentric strap springs in at the ends after boring. A molder may not know how large a gate to cut. How about the machinist not knowing the change gear rule for simple and compound geared lathes? And so on to the end.

Before closing I want to give the molder a piece of advice as to how to overcome one of the troubles that causes him more worry than all the rest combined. All little jobbing shops that melt several grades of iron at one heat are troubled more or less with hard iron, and the molder catches all the blame. Now, friends (if you will permit a machinist to call you names), let me tell you how I once saw an old fellow charge. When he wanted, say, 500 pounds of machine castings, and the balance of the heat was to be low grade work, he would let his bed burn through good and red; then he would put on about 800 pounds of pig and melt it. After the machinery castings were made he would stop the blast and charge for the low grade work, and in this way he never was troubled with his iron becoming mixed.

BEN AROUND.

▲ ▲ ▲

Indicator Practice.

Editor American Machinist:

Following up the line of Mr. Tecumseh Swift's article on "Universally Incorrect Indicator Practice," I would like to point out a portion of that article which seems to me to be misleading.

We shall see the difficulty more clearly if we recall what is represented by those indicator diagrams and the other diagrams which Mr. Swift has deduced from them. The vertical distances represent pressures, and by laying off the ordinates above or below the line of no pressure we may show the direction of the pressures. The horizontal distances represent piston travel, and the product of the two, or the area, represents work. By laying off the ordinates so that the area inclosed between the curve and the line of no pressure comes above or below that line, we may indicate whether the work is *positive* or *negative*.

But the work may change from negative to positive (through a reversal of the direction of motion of the piston) without a corresponding change in the direction of the pressure. Hence it is not possible by the above means to represent both pressure and work clearly in one continuous diagram. We may make a shift to do it by other means, as shown later.

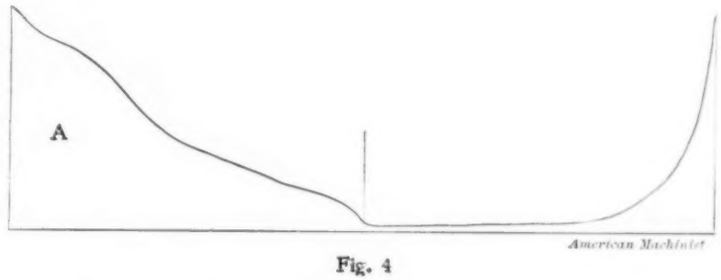

Fig. 4

PRESSURE FOR WHOLE REVOLUTION, ONE SIDE OF PISTON.

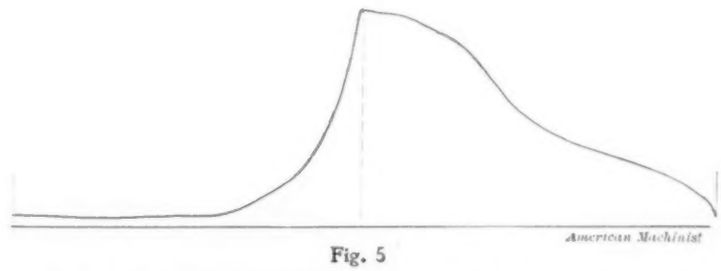

Fig. 5

PRESSURE FOR WHOLE REVOLUTION, OTHER SIDE OF PISTON.

Take, for instance, Fig. 4. The direction of motion of the piston is reversed at the middle of the horizontal line, but the pressure on one side of the piston remains constantly in the same direction. Thus the area under the first half of the curve represents positive work, while that under the second half represents negative work. Were this diagram, Fig. 4, repeated for several successive strokes we should have a continuous diagram, such as illustrated in Professor Gray's article in the "American Machinist" of June 17, 1897. In this connection Professor Jacobus ("American Machinist," June 3, 1897) called attention to the absence in Professor Gray's instrument of a means of indicating the ends of the strokes, which he pointed out was important, as one-half of the length of the record represented negative work. Thus Fig. 4 correctly represents the pressure on one side of the piston, but does not distinguish positive from negative work.

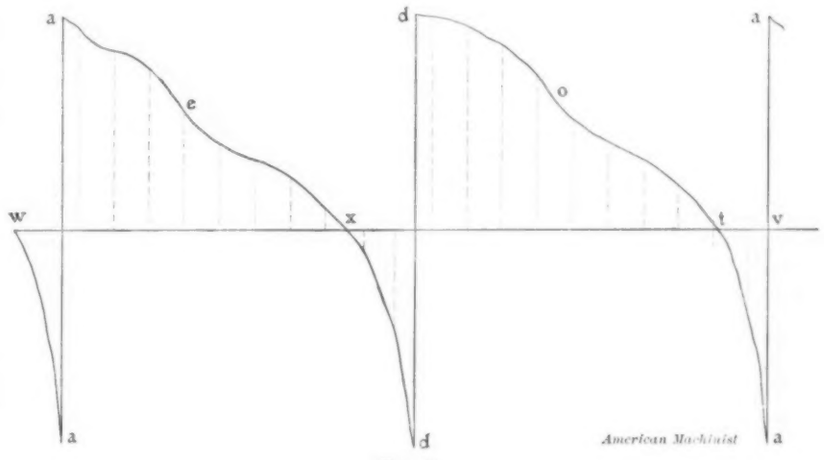

Fig. 7

DISTRIBUTION OF NET EFFECTIVE PRESSURE.

Fig. 7, on the other hand, correctly represents the distribution of the work, but a little reflection must convince anyone that it is misleading in showing the

distribution of the net effective pressure. The work changes instantaneously from negative to positive at the end of the stroke, as shown, but the pressure, instead of being reversed with the infinite rapidity indicated by the diagram, does not change its direction at all, and its intensity only slightly. We may construct the line curve showing the distribution of the net effective pressure by combining the curves in Fig. 4 and 5, remembering that the ordinates to the curve in Fig. 4 represent pressures in one direction, while those in Fig. 5 represent pressures in the opposite direction. The ordinates to the new curve will be the differences between the ordinates to corresponding points of the curves in Figs. 4 and 5, and these ordinates should be laid off above or below the line of no pressure, according as the ordinate in Fig. 4 or in Fig. 5 is the greater. This gives a curve such

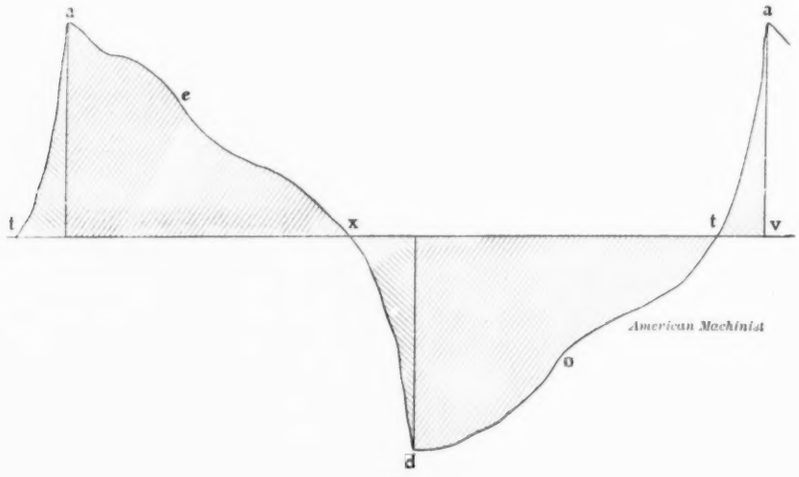

Fig. 8

ANOTHER MODE OF SHOWING THE SAME.

as shown in Fig. 8. In this diagram the areas representing positive work are distinguished from those representing negative work by the cross hatching.

Fig. 8 shows that the net pressure on the piston reverses its direction at the points *x* and *t*, near the end of the stroke, but does not change its direction at the end of the stroke. The work, however, changes instantaneously from negative to positive at the end of the stroke, as shown. The steepness of the curve at the points *x* and *t* shows the rate at which the pressure changes in intensity at the time it reverses its direction.

The writer would also like to call attention to the fact that it is not necessary, in computing the m. e. p. from Fig. 2, to measure the positive and negative areas separately, and to subtract the one from the other. The planimeter will do the subtracting if run around the diagram in the direction *a*, *b*, *d*, *c*.

HARRY V. HAIGHT.

Halifax, N. S.

Opening for American Goods in Belgium.

It may possibly not have come to the notice of American manufacturers that an Anglo-American Chamber of Commerce has been recently established in Belgium, with its headquarters at Brussels. To those who have followed the trade development of Belgium during the last few years the formation of this chamber embracing Anglo-American commerce is full of significance. The honorary presidents are the United States and British consul-generals, and the list of the council includes the names of well-known English and American merchants. Its object is to promote the trade of the two countries with Belgium, and its membership is restricted to citizens of the United States and the United Kingdom. The annual subscription per member is $10. It provides its members with all sorts of business information, especially as to credits, agencies, names of firms engaged in particular trades, customs tariffs, advice on exhibition matters and so on.

The formation of such a body clearly shows that business is to be done between the United States and Belgium, and to those who know the latter country the only wonder is that American machinery, machine tools and hardware (to take only one section of American manufacture) have not found a wider market there than they have done. I think the real fault lies with your exporters in being too "stand off" and exacting as to terms, forgetting that Belgium is one of the best hives of industry in the world. There is no reason why American manufacturers should not do as good a trade in Belgium as they do in England. Certainly there is nothing to stop them. The Belgian commercial treaty with the United States contains the most-favored nation clause; but America, like other cattle-exporting countries, has suffered considerably from the prohibition which has been in force of late years against the importation of live beasts for fattening. The lines of steamers running between Antwerp and the principal United States ports are of a very high class and numerous, and freights are reasonable.

Among the principal articles shipped from the United States and finding a good market in Belgium are (as regards manufactured goods) electrical apparatus, machine tools, machinery, stoves, sewing machines, typewriters, safes, steam engines, boilers, etc. In all these lines there is really good trade to be done in Belgium by American dealers if they will only take the trouble to secure the trade; only they must be willing to spend a little money first and not be too easily discouraged, because success does not always come at first. There are no official restrictions or discriminations or special effect of customs tariffs upon imports from the United States into Belgium. A good many American exporters have recently begun to take an interest in this market, and have been making inquiries as to dealers in the chief towns who might buy American goods. One excellent way to open up business would be to establish an agency at Brussels for the representation of several lines of American manufactures. It could be done by several firms co-operating to pay the expenses, including the salary of a really competent manager, who would be both familiar with the merits of American products, the way they should be introduced and the manner of doing business in the country. Those best able to give an opinion believe that if an energetic propaganda of this kind were undertaken American merchants might supply half of the foreign goods now sent to Belgium by other countries. The word "American" is known throughout the country as being synonymous with whatever is ingenious, useful and excellent in workmanship and quality of materials.

Anyone who has traveled much in the Belgian towns must have noticed the number of copies of American machines. The editor of the "American Machinist," when at the Brussels Exposition, found that "sometimes they copy a good tool, but as often a bad one, or spoil a good one by changes imagined to be improvements. The Belgian exhibit of tools is, in the main, a copy of our own and of English practice, and is of that indescribable character which is always noticeable in copied machinery."

I would advise your firms not to try and open up trade by correspondence nor by sending any catalogs. That should follow personal application by trustworthy persons on the spot, as indicated above. A move in this direction was made about a year ago and a capital

storeroom of American manufactures was opened in Brussels as a permanent exposition of American goods and manufactured products, including various electrical apparatus, stoves, sewing machines, cycles, safes, typewriters, boilers, etc., all being strictly of American origin. What has been done in Brussels should be carried out in all the principal Belgian towns.

I notice that Consul Morris, writing from Ghent in April, 1897, said that the most advantageous center from which to develop European trade is emphatically Belgium, not only on account of its geographical position but also by reason of its importance as an industrial and manufacturing country, with its 6,500,000 inhabitants crowded together in a territory as large only as the State of Maryland, all ready to welcome American goods and manufactures, if the latter are sent without fraudulent representation, and are found to be profitable and economical. The field is open, and through this gateway American trade may pass into the wider domain of the entire Continent.

One of the leading importers in Brussels dealing in agricultural and general machinery, farm implements, machine tools and hardware, says that he generally gets these American goods from England, Hamburg, Bremen, and only to a small extent from New York. They find the quality excellent, but that the style being different from European manufactures it is difficult to make a comparison, except in lawn mowers, which they prefer to the English make on account of their beauty and simplicity; also hay and manure forks, which are preferred by reason of their fine quality. All American hardware has hitherto been made known to Belgian dealers by London and Hamburg houses. This method is convenient, but more expensive to the buyers. This firm of importers add that a depot well filled with American articles, located in Brussels, would be very profitable to those undertaking it.

The stoves and sewing machines sold in the country are more expensive than the German ones, but they are much better, and sell in consequence of their better workmanship. There is a constantly increasing demand for heating stoves. Those generally in use are similar in style and system to the American stove known as the "base burner." The one now mostly employed comes from Germany, and is in nearly every detail identical with the American product. This line of trade should be entirely in the hands of American exporters.

There is one thing which tends to retard the progress of American trade in Belgium, and it is the employment of customs agents by American firms, which increases the cost of the goods to such an extent as to seriously handicap them in competition. For instance, I have heard of a case where the purchaser of a package containing goods worth $7.50 had to pay charges amounting to $7.60!

F. C. CHAPPELL.

London.

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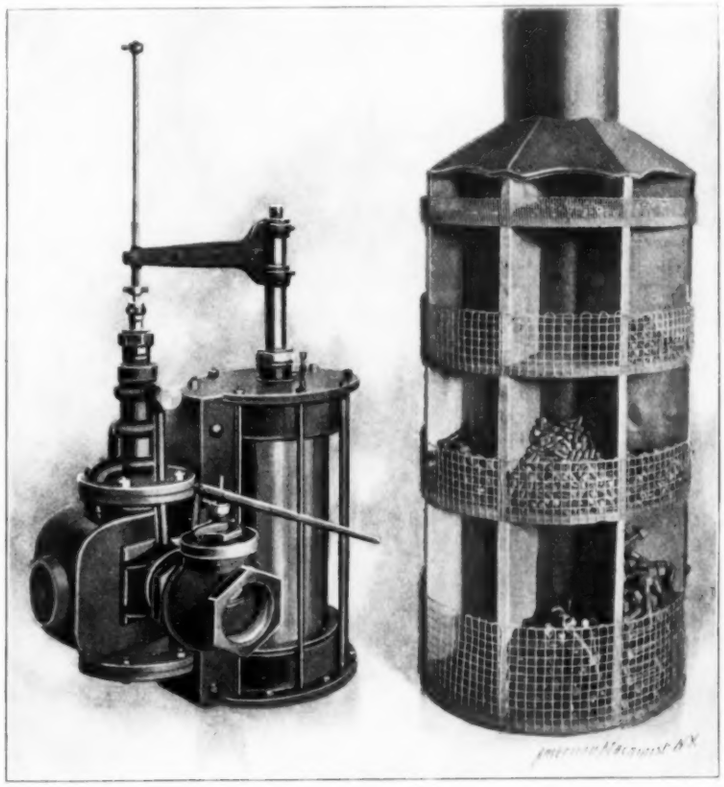
Utilizing a Shop Column.

The neat arrangement shown in the accompanying half-tone was noticed during a recent visit to the works of the Ross Valve Company, Troy, N. Y. A column in the machine shop is surrounded by the bins or pockets as shown, and they are filled with bolts, set screws, washers and similar stock articles which are frequently used in the immediate neighborhood, and the column is transformed from an unmitigated nuisance to a great convenience.



UTILIZING A SHOP COLUMN.

There are eight pockets in each tier, or thirty-two in all. The cover is of thin stuff and shellacked. The use of wire netting instead of wood for the front of the bins is an important feature, as it makes it easy to see the entire contents and also allows the bins to be brushed out before refilling. In the stock-room of the works the wire netting is employed for the fronts of all the shelving, and also for the backs of the bins when they are not against the wall.

The apparatus at the left is one of the hydraulic organ blowing engines built by this firm.

Technical Publications.

We have received from Robert Fortune (foot of Walker street, Detroit) what he calls "Blue Print Standards, Nos. 1 to 50, Series A." These are blue prints 8x11 inches, and give a large variety of tables, diagrams, formulas, etc., useful especially to draftsmen, engineers, designers and others concerned with machine construction. The prints are arranged alphabetically, according to subjects and with a marginal index. These are certainly very conveniently arranged and would prove useful to many, though one might wish occasionally for some hint as to the authority for the "standards" given. For instance, in the case of a pillow block, what is called a "standard" can be of course only the author's selection or choice of a design. There is no such thing, nor can there be any such thing, as a "standard" pillow block. Much the same might be said of "standard" gear wheel arms, and certainly the "standard" sections given to indicate various materials of construction do not represent the universal practice of the comparatively few who adopt this tedious method, instead of the much better one of simply writing the name of the material in.

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Some of the men who volunteered for service in the steam engineering branch of the navy complain of bad treatment received.

AMERICAN MACHINIST

Published Thursdays by

American Machinist Publishing Co.,

256 Broadway, New York.
JOHN A. HILL, President and Treasurer.
C. A. HANSMANN, Sec'y.

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Subscription Price:

$3.00 a year in advance, postage prepaid in the United States, Canada and Mexico.

$4.00 a year to other countries, postage prepaid.
Entered at Post Office, New York, as second-class mail matter.

For Sale by Newsdealers, Everywhere.
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Foreign Observers in American Machine Shops.

It is of course well known to most of our readers that following immediately upon the successful invasion of the European market by American machine builders has come a counter invasion of American shops by observers from Europe, who come here avowedly to learn our characteristic methods. Scarcely a week passes that we do not hear of a new arrival on this mission, most of whom, it is significant to say, come from Germany—a fact which illustrates as well as anything could the determined manner in which Germany has entered the manufacturing field. Moreover, not only is this a piece of testimony to this fact, but it is an acknowledgment of the value set on American methods, while the freedom with which they are given access to our shops is an illustration of the broad spirit of liberality which pervades American establishments.

We have heard many fears expressed that this course on the part of our shop managers is unwise, and while we have no sympathy with the spirit thus expressed, it may comfort those who feel this way if we give the impressions which we have formed regarding the value of these observation trips to those who make them.

We would not willingly say a word to foster a spirit of self-complacency in these matters—a spirit that is the outcome of a feeling of buncombe and of a belief that the American mechanic is a better one than any other. The rude awakening of England to the fact of outside competition in fields that by historic tradition and by right of long possession belonged to her should serve as a warning to us that leadership does not follow on tradition, and that it is only held when once gained by continued unremitting effort.

At the same time, commendable as is the spirit which sends these men here, we do not believe that they are acquiring a store of information at all commensurate with the effort, or that they will carry back enough results of their observations to be of any great value to them, and this for the reason that they—that is, the most of them—are not fitted to observe with profit.

It is a truism among scientific men that successful observations can be made only by trained observers—the observer must know what to look for and be able to assign a proper value to what he sees. There is no field of observation in which this is more true than in a machine shop. To the outsider all shops—those which are conducted on the most highly organized system and those in which confusion reigns supreme—are pretty much alike. There is to him the same *apparent* confusion in all; the words clean and orderly seem the last ones to properly apply to any, while the best and newest plan of manufacture of a given piece, to one who is ignorant of older methods, always seems to be the most obvious way in the world to make the piece, and the merits of the new method are entirely lost sight of. It is but an illustration of the universal fact that all knowledge is comparative, and the supposed observer, having no base of comparison, acquires no knowledge.

Now we believe this to accurately describe the observations of the average German observer of American shops, and we make the statement with considerable knowledge of them and of their methods of observation. We make it, too, with full knowledge that many of these men are highly educated, highly intelligent and of tireless industry. The trouble with them is that, so far as the shop is concerned, they are outsiders. In short, they are book men, in some cases professors, whose knowledge of machinery is—and we say it without the slightest desire to cast aspersion at the word—book knowledge. Of knowledge of methods of production they have little or none, and of valuable or discriminating observations of such methods they are incapable.

We are not so foolish as to attempt to prove a proposition like this by appeal to an individual illustration—anything can be proven in that way—but a recent case which fell under our own eye so well illustrates what we have said that it seems worth repeating, as we believe it to be fairly representative. A highly educated and intelligent professor in a German school of engineering recently made an extended American tour, and we met him at a well-known shop, one of the striking features of which is a hydraulic flanging machine which is probably the most perfect and highly organized machine of its class in existence, while the work turned out by it is a delight to any mechanic's eye. To anyone familiar with the toil and labor of flange turning by hand the machine would command instant attention, while to another who knew the long course of development of flanging machines and the different plans on which such machines have been built, with varying degrees of success, this machine, as the latest development of the art, with its equipment of dies for all classes of work and of a cost running well into five figures, would have riveted attention and profitably consumed hours of observation. Our German professor knew of course all about boilers from his standpoint. Of types, strength, proportions, efficiency and what not he doubtless knew all that is worth knowing, but *making* boilers was beyond his ken, and he passed that machine by—though it was in full operation at the time—with scarcely a remark upon it. It worked so well, its work was so perfect, and there was so little fuss about it that it was to his mind the most obvious way in the world to turn flanges, and there was nothing about it at all noteworthy or of any particular merit. Such is the influence of the point of view.

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Cone Pulleys.

Some parts of Professor Sweet's method of proportioning cone pulleys, published elsewhere in this issue, have appeared before, but other parts, so far as we know, have not before been published, and are in fact new to us, while all the steps are certainly not to be found properly assembled elsewhere. We count ourselves fortunate in being able to present the method entire.

This problem of proportioning cone pulleys is one with which many have wrestled unsuccessfully. The first diagram of the professor's article was made from a lathe which, when new, was probably as good a lathe as was at that time made in this country, and moreover it came from the shop of all shops where one would most expect such matters to be properly looked after. It is true that it was made several years ago, but we do not imagine it would be necessary to look far to find lathes and other tools being turned out to-day with just as badly proportioned cone pulleys as this one had. In fact we do not believe there are many machine tool draftsmen to-day who have any better method of laying out

cone pulleys than that of cut and try, and usually with few cuts and few trys at that, for the problem on that plan of solution is a particularly exasperating one, and the oh-it-don't-make-much-difference stage is apt to come early in the process.

Not only are the methods simple and the diagrams easily made with ordinary instruments, but they have the added merit of being related to the mechanism in such a suggestive way as to greatly assist the memory in retaining them.

To all who have to deal with cone pulley design this issue will, we think, come as a prize number.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(100) W. T. C., Scranton, Pa., writes: I have seen it stated in print that the total tension on the two sides of a belt is constant, or that it is the same whether the belt is driving or at rest, the driving effect when running being due merely to the difference in tension of the two sides. Is this correct? A. It cannot possibly be correct in all cases. We have seen in a reputable engine manufactory the main belt running up from the pulley on the engine shaft at an angle of about 45 degrees, to the pulley on the line shaft, the slack side of the belt on top, and sagging so that it almost touched the lower or pulling belt. When the engine was stopped there could have been practically no tension on either side of the belt, while when running the pull on the lower side was probably 700 or 800 pounds.

(101) E. R. P., Montpelier, Vt., sends a sketch of a crane hook which, by calculation, he finds should fail with a load of about 100,000 pounds, while it has actually lifted 120,000 pounds with no

American Machinist

signs of failure. He also desires to know if the hook is well designed. A. The formulas which you give are purely analytical. We have no faith that any formula of this kind will give anything better than very roughly approximate results when applied to a detail in which the strains are as complex as in a crane hook. The most definite formulas for crane hook design are those published by Mr. H. R. Towne some years ago in his Treatise on Cranes, but these would call for a much heavier hook than yours for a load of 60 tons. In Mr. Towne's books the metal was flatted, as indicated in the accompanying sketch. This is obviously a more advantageously distribution of the metal than is obtained by merely bending a round bar as you have done. Another excellent feature of Mr. Towne's design is the depth of the hook, as in case of failure it holds the load longer before letting go of the sling, and thus is more apt than a shallow hook to call attention to the danger and give time to permit the load to be lowered.

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Personal.

Passed Assistant Engineer F. W. Bartlett, of the United States steamship Vesuvius, has been promoted to the rank of chief engineer.

It is announced that Mr. Frank Mossberg's active connection with the Mossberg & Granville Company, of Providence, has been severed.

Mr. Fred W. Sadlier, of Gorham, N. H., has accepted the position of assistant master mechanic in the Grand Trunk machine shops at Island Pond, Vt.

Robert Carney, of Willimantic, late foreman of the Morrison Machine Company, of that place, has taken a position with the Unitype Company, South Manchester, Conn.

Mr. F. G. Kretschmer, formerly in charge of the New York office of the Brown & Sharpe Company, and now with Diechmann & Sohn, Berlin, arrived on the Pretoria September 24 for a visit to America.

Mr. Leon del Monte, an American residing at Dundee, Scotland, who holds the agency for several American manufacturing companies, including the subagency for the Pratt & Whitney and Brown & Sharpe companies, is at the Hotel Manhattan, New York. He will leave for Europe soon with a number of new agencies.

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Obituary.

William H. Morris, of the firm of Morris & Barlow, iron founders, of Newark, N. J., died suddenly in Philadelphia on October 5, sixty-two years old. Mr. Morris had been in the foundry business forty-eight years.

James Carmichael, superintendent of the machine shops of the Harlan & Hollingsworth Company, Wilmington, Del., died in that city October 8, sixty-nine years old. He had been in the employ of the company forty-eight years, and for the greater portion of the time and until his last illness in the position mentioned.

Charles Staples, Jr., died at Portland, Me., October 4, seventy-seven years old. He learned the machinist trade in the shop of his father in Portland, and later was a partner in the concern. He went to California with the Forty-niners, and after his return went into the machine business again. After the great fire in Portland he was appointed United States Inspector of Steam Boilers, which position he held until a year ago.

William Shaffer died at Reading, Pa., September 29, sixty-one years old. He was born in Sanatoga, Pa., but spent most of his life in Reading. He was in the machine shop of the Johnston Foundry Company twenty years, most of the time as foreman. He was after that a member of the firm of Davis, Printz & Co. for twenty-two years.

Hugh H. Cline, chief engineer U. S. N. (retired), died in Brooklyn, N. Y., October 6. Mr. Cline entered the navy July 1, 1861, was made chief engineer July 2, 1887, and retired August 27, 1894. He was aboard the Wyoming when she went to China in pursuit of the Confederate cruiser Alabama. On this cruise the Wyoming had an engagement with three Japanese war vessels. His last service was on the cruiser Charleston during the Brazilian rebellion.

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Index Rings for Turrets.

In reference to the letter published in our issue of August 11 on "Index Rings for Turrets," calling attention to the advantages of having one straight and radial side to the locking bolt and crediting the idea to the Pratt & Whitney Company, we have received a letter from Mr. F. A. Pratt, in which he says:

"I did not originate the turret head bolt, but stole it from Colts Arms Company about the year 1860, and I cannot comprehend why all bolts to be used for such purposes have not been made in this manner. We use no other construction.

"Besides the points mentioned in the letter published in your issue of August 11, it is to be noted that in the common construction (equal taper on both sides) the momentum of the turret almost invariably carries the notch beyond the bolt, and the bolt, if the spring has sufficient power, must revolve the turret backward until the notch coincides with the bolt, but in the slot with a radial side, the bolt striking before it reaches the bottom of the slot, stops the turret in its proper place and easily slides to the bottom without moving the turret. You will understand that it is not an easy matter to revolve a turret either by hand or automatically and bring the notch invariably up to the center of the bolt exactly, but that the bolt will either stop short or go past the center, depending upon the speed and condition of the revolving parts. With the radial side bolt slot the slot is so timed that in all cases the bolt does not quite reach the bottom when the motion of turret stops.

"I cannot say at present who invented this stop bolt. It lies between two men,

both excellent mechanical engineers, not only in theory but in practice, and both having worked as machinists. I refer to E. K. Root, formerly president of Colts Arms Company, and Samuel Batchelder, superintendent under Mr. Root. Both died many years ago."

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Commercial Review.

NEW YORK, Saturday Evening, Oct 8

MACHINISTS' SUPPLIES, ETC.

We believe that the condition of general business in this country is wholesome, and that the nation is rising out of the great business depression of the nineties. This being the case no fears need be entertained for the machinists' supply line more than for any other. In this city, where sales houses are many and competition keen, but machine shops and manufactories do not play a leading part, it is hardly to be expected that supply dealers should be affected by the reviving influences of industry to as noticeable a degree as in some other localities. It was natural to look for great things this autumn, and it is natural to be discontented with small things, even if they are enough to aggregate a good living trade. This much may be said at least, that many houses have noted some improvement within four weeks past and a few regard the revival of their business as eminently satisfactory. Leading sellers of power transmitting machinery are getting an excellent trade; much better, for instance, than that received by the file makers, and this activity in the former line is a circumstance which we have noticed for a long time past.

The head of one concern, which, from the amount of business it does and the lines of goods it handles, may be classed among the two or three most representative machinists' supply houses in the city, sums up the situation as follows: "Business is not very good, and it is not very bad. We don't know that we have anything we ought to complain of. Our sales by September 1 this year had surpassed those of the entire year 1897. Our trade was as good several weeks ago as it is now, and I do not expect to see any early change in conditions."

The L. S. Starrett Company's works are very busy, and its trade in this market has shown an excellent increase with the oncoming of the active autumn season. A manufacturing company like this is perhaps a better criterion of business than the abundant middlemen's concerns.

The Cleveland Twist Drill Company is now running its factory eleven hours a day, which is ten or twelve hours a week more than usual, and is employing more men than ever. It contemplates erecting a new plant, which will double the capacity of the works. We understand that the demand in this district has improved of late and that quite large orders are coming in, which at this time include a considerable proportion of stock orders.

The Standard Tool Company, of Cleveland, which also manufactures twist drills, is about completing a building for the electric welding of bicycle parts, which is a department of its business.

The Webster Manufacturing Company, of Chicago, is in receipt of some more large contracts, including one for an elevator equipment of exceptional magnitude. It will be installed in a 2,000,000 bushel grain elevator of Armour & Co., at Chicago. A 20-ton (per day) cotton-seed oil mill has ordered a complete machinery outfit, from boilers up to presses. In this district the Webster Company has received an order for a power transmitting machinery equipment for a plant of the New York Belting & Packing Company at Passaic, N. J.

Two concerns from which we have received reports include gas engines among their lines of merchandise. One observes that the demand, which has been very active, has fallen off a little; the other that it has notably increased, inquiries running ten a day.

CUBAN TRADE.

An emery wheel agent reports having sent two small consignments to Havana last month. Two medium sized engines for plantation work in Cuba have been ordered from a New York agent. Sugar machinery to the amount of nearly $15,000 is said to have left for Havana on the City of Washington October 1, and that which went October 5 on the Seneca is estimated at almost $10,000.

MISCELLANEOUS.

A tandem compound Corliss engine is in requisition by the city of Topeka, Kan. Bids will be received until November 7 by William H. Barnes, city engineer.

The Bureau of Supplies and Accounts of the Navy Department will until noon, October 18, receive bids to furnish at the navy yard Norfolk, Va., one electric traveling crane.

Awards for the four monitors to be constructed for the navy have been made as follows: Lewis Nixon, $825,000; Newport News Shipbuilding & Dry Dock Company, $860,000; Bath Iron Works, $862,000; Union Iron Works, $875,000.

Through a New York banking firm $25,000 worth of machine shop tools are said to have been ordered this week of various American manufacturers, for shipment to Hamburg, to be reshipped to Russia.

A project is said to be on foot to unite the warship building, armor plate and gunmaking interests of the world in one great syndicate, whose factories shall be located near Cleveland, Ohio, the Lakes meanwhile being united with the sea by canal. The next thing will be to unite all the navies of the world in one big squadron to be manœuvred from Washington.

Mr. J. W. Duntley, president of the Chicago Pneumatic Tool Company, has returned from an extended business trip to the Pacific Coast, as far as Victoria, B. C., and has met with very good success, owing to which the company has decided to open an office at 537 Mission street, San Francisco. Mr. Duntley reports an increased demand on the Coast for pneumatic air drills, hammers, riveters and the like.

On the 1st of this month the Union Carbide Company contracted with the Niagara Falls Power Company to have furnished to it at its plant on the power company's lands 5,000 additional horse-power of current. This will consume the entire output of one of the big generators, and to accommodate the current the carbide company will build a $100,000 extension of its plant. Not many months ago it placed a contract for 10,000 horse-power of hydraulic and electric machinery to utilize the energy of the falls at Sault Ste. Marie, Mich. The calcium carbide industry is making enormous progress. It was first exploited as a commercial possibility only about four years ago, and during the present year the statement was made that there were in Europe and America twenty-two establishments where it was produced, with several more in course of construction.

Our advertising columns contain mention of an auction sale of new and second-hand machinery to be held October

Continued on page 37.

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Business Specials.

Gear wheels, gear cutting. Grant; see page 18.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Conn.

Send for my water tube boiler catalog. E. P. Watson, Elizabeth, N. J.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

A manufacturing concern having large shops with modern tools, foundry, pattern shop, etc., is desirous of adding to its present line, and wishes to negotiate with parties wanting mach'y. built. Box 36, AM. MA.

For Sale or Rent—Foundry and machine shop with additional land, in good condition and well equipped for medium heavy work; capacity of foundry 7 tons per day; located on railroad within eight miles of New York; terms easy. Call or address J. F. Sweasy, 26 Nassau street, New York.

Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Situation wanted by traveling mach. or tool salesman; 6 yrs.' exp.; first-class ref. Box 30, AM. MACH.

Draftsman, mechanical, wants position; experience, general machinery. Address Box 38, AM. MACHINIST.

Draftsman and machinist; boilers, engines and general machinery. Box 27, care of AMERICAN MACHINIST.

Draftsman, five years' experience; watch machine, bench machine and small work. Box 31, AM. MACH.

Draftsman, educated, exp.; position in small shop wanting services part of time only. Box 21, AM. MACH.

A position wanted as foreman of machine shop by a first-class man; heavy or light work; accustomed to management of men; best ref. Box 29, AM MACH.

Situations Wanted—Continued.

Mechanical draftsman desires to change; 7 years' shop and office experience. Box 34, AM. MACHINIST.

Draftsman wants change; prefers light watch machinery or similar work; good ref. Box 250, AM. MA.

Toolmaker, fifteen years' experience as foreman, desires to make a change; N. E. preferred; first-class references. Address Box 24, AMERICAN MACHINIST.

A1 mechanic with unquestionable reference wants position as general foreman or sup't; a hustler and up to date; good manager of men. Box 26, AM. MACH.

Draftsman and mechanical engineer, 20 years' varied experience; practical designer of high grade engines, tools, etc., desires situation. Box 23, AM. MACHINIST.

Mechanical draftsman, shop practice, good designer, general, power transmission mach., steady, is open for engagement. Address Box 28, AMERICAN MACHINIST.

First class draftsman and designer on general machinery, jigs and tool fixtures open for engagement on or after October 15. Box 33, AMERICAN MACHINIST.

Young man at present employed erecting two vertical triple expansion pumping engines open for engagement; exp. as manager and sup't of works; good draftsman. Address Box 25, care of AM. MACHINIST.

Competent mechanical draftsman wishes situation; technical graduate; 10 years' shop and drawing room experience; special, automatic, printing and gen. mach.; good character; A1 ref. Box 37, AM MA.

An engineer, machinist, draftsman and electrician; served regular apprenticeship; successful as journeyman; foreman mach. shop; chief engineer and master mech factories and office bldgs.; desires pos. in line with his exp. or as ass't on large plant. Box 9, AM. MA.

Wanted--Position by a practical mechanic who has had experience in handling from ten to twelve hundred men systematically; fully capable of originating special tools devices and machinery for light manufacturing, such as bicycles, sewing machines, &c; no objection to going abroad; exceptionally good references. Box 2, AMERICAN MACHINIST.

A practical man with an extensive and successful exp. in the handling of factories, manufacturing engines, electrical apparatus, saw mill, power transmitting, mining and general machinery, wishes to correspond with parties requiring a sup't or manager who has made economical production a special study; salary or an interest. Address Box 6, AM. MACHINIST.

Help Wanted.

A few additional apprentices will be received by R. Hoe & Co., printing press mfrs., to learn the machinist's trade in its various branches; attendance at firm's evening school three even'gs each week is exp'd. Apply pers'ly or by letter R. Hoe & Co., 504 Grand St., N. Y.

Wanted—Foreman for shop in Philadelphia building high grade, light and heavy mach'y; state age, exp., salary desired and ref. Box 13, AM. MACH.

Wanted—A few first class machinists; also two bench men; must be familiar with water wheels, paper mill and electrical machinery. Ad. Box 4, AM. MACH.

Wanted at once a first-class traveling man for an Ohio supply house to travel in Ohio and Indiana. Address Supply, care AMERICAN MACHINIST, New York City.

Wanted—Competent man for foreman in machine shop; one familiar with water wheels and other heavy machinery; must come well recommended. Address Box 3, AMERICAN MACHINIST.

Machinist—Good all round man, thoroughly acquainted with modern methods and competent to handle help; state experience, wages and references. Niagara Machine & Tool Works, Buffalo, N. Y.

Man for foreman or superintendent of a small shop, one who is familiar with the use of tools and can direct the work of others; must be able to design and make drawings for mechanical devices, and should have a fairly good knowledge of electrical machinery. Address Box 20, AMERICAN MACHINIST.

Wanted—An energetic gang foreman; must be accustomed to engine and general machine shop work; will be required to handle about twenty men; must be able to work from drawings; this is a good opening for a bright young man; state age, experience, nationality and give reference as to character and ability. Address Box 8, AMERICAN MACHINIST.

Wanted—A progressive Western concern, employing 350 men, manufacturing agricultural implements, wants an up-to-date, industrious young man as gen. foreman or assistant supt; must have had exp. in this line and understand the handling of men; none but capable, exp. men need apply; a permanent pos. for the right man. Address, giving age, experience and salary expected, Box 35, care of AMERICAN MACHINIST.

Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Philadelphia Book Co., Phila., Pa., catalog free.

Caliper catalog free. E. G. Smith, Columbia, Pa.

Book, Dies & Die Making, $1. J. L. Lucas, Prov., R. I.

Mechanical engineer, located South, of long exp. as constructing engineer, wants few good agencies on sal. and com; would travel. Address Box 32, AM. MA.

THE BRADFORD BELTING CO.
CINCINNATI, OHIO, U. S. A.
"MONARCH" RIVETLESS LEATHER BELTING.
Write for Catalog "A."

ENGINE and SPEED LATHES
IN VARIOUS LENGTHS—9 to 15 in. SWING.
Latest and Most Approved Designs. Workmanship, Material and Finish of the Highest Order.
SEBASTIAN LATHE COMPANY,
117 and 119 Culvert Street, CINCINNATI, OHIO, U. S. A.
Agents: SELIG, SONNENTHAL & Co., London, Eng.; JOHN TRAGARDH & Co., Goteborg, Sweden; E. SONNENTHAL, JR., Berlin, Germany; R. S STOKVIS & ZONEN, Rotterdam, Holland.

Thermo-Dynamics of the Steam Engine and other Heat Engines.
By C. H. PEABODY,
Professor of Marine Engineering and Naval Architecture, Massachusetts Institute of Technology.
Fourth Edition. Rewritten and Reset.
8 vo, CLOTH, $5.00.
JOHN WILEY & SONS, 53 East 10th Street, New York City.

"Lightning" Screw Plates for Machinists, Electricians, Bicycle Repairers, etc. Adjustable Dies with Guides.
Send for Catalogue.
WILEY & RUSSELL MFG. CO.,
GREENFIELD MASS, U. S. A.
Agents in London, SELIG, SONNENTHAL & CO. 85 Queen Victoria Street

Jenkins Standard '96 Packing
weighs 33⅓ per cent. less, does not **Rot, Burn** or **Blow Out,** and will last longer than most joint packings; therefore the cheapest and best for all purposes.
Good buyers compare weights.
Genuine stamped like cut.
JENKINS BROS., New York, Boston, Philadelphia, Chicago.

19, by Hill, Clarke & Co., at the works of the Ames Manufacturing Company, Chicopee, Mass. Such a lot of old tools will be disposed of that some good bargains ought to be secured. All are in good running order. There are about fifty new machines, and many even of the second-hand ones are said to be in fine condition.

MACHINERY EXPORTS FOR AUGUST.

The number of the "Monthly Summary of Finance and Commerce" compiled by the Bureau of Statistics, Treasury Department, to cover the foreign trade of August, has just been issued. It is to be noticed that the exports of metal-working machinery, of locomotive engines, of boilers and parts of engines and of shoe machinery exhibit a large increase as compared with August, 1897. Pumps and pumping machinery show little change, but stationary engines are markedly falling off.

For the month of August, 1898, metal-working machinery exports amounted to $573,215; for August, 1897, $314,600. The figures for July, 1898, have been reported $401,100. For the eight months ending August, 1898, they are $3,552,110. Electrical machinery exports were: For August, 1898, $143,151; August, 1897, $178,713; July, 1898, $161,481; eight months ending August, 1898, $1,439,743. Pumps and pumping machinery: For August, 1898, $194,273; August, 1897, $191,091; July, 1898, $166,056; eight months ending August, 1898, $1,428,029. Shoe machinery: For August, 1898, $81,692; August, 1897, $52,866; July, 1898, $44,797; eight months ending August, 1898, $617,025.

Exports of other lines of machinery included: Locomotive engines, for August, 1898, 59 in number, valued at $640,322; August, 1897, 42, at $326,627; July, 1898, 70, at $635,766; eight months ending August, 1898, 428, at $3,844,917; eight months ending August, 1897, 245, at $2,231,064. The figures upon stationary engines are: For August, 1898, 39 in number, aggregating $20,187; August, 1897, 64, at $46,838; July, 1898, 30, at $21,325; eight months ending August, 1898, 358, at $258,274; eight months ending August, 1897, 392, at $252,303. Upon boilers and parts of engines they are: For August, 1898, $123,572; August, 1897, $70,976; July, 1898, $106,209; eight months ending August, 1898, $749,063; eight months ending August, 1897, $414,732. Upon printing presses and parts thereof they were: For August, 1898, $38,777; August, 1897, $51,195; July, 1898, $34,484; eight months ending August, 1898, $528,755; eight months ending August, 1897, $432,283.

CHICAGO MACHINERY MARKET.

Machine supplies are keeping even pace with the machine tool trade. There is a steady demand for all kinds of seasonable goods. Activity in belting is

greatest at present in the South, where sawmills are buying very largely. The sawmill trade is absorbing more belting just now than the machine shops. Of the Southern trade, that of the Gulf States seems the more satisfactory. Lumber interests in that locality are being developed rapidly, and the approaching cold weather does not slacken activity as it does in the Northwest.

For emery wheels inquiry is increasing. Plow works are starting up and are buying generously. Many manufactories are taking larger quantities than ever before. One manufacturer of this city, who last season consumed 40,000 emery wheels, will next season require about 75,000 wheels. Other large manufactories are buying in lots of 1,000 or more. While the demand for emery wheels has not been phenomenally active, there is on the whole quite an improvement over the corresponding period last year.

Plating supplies also have enjoyed a trade that exceeds that for last year. Not many new outfits have been sold, and the trade has been more noticeably among the large works than the small shops. The latter are often busiest when they receive the overflow trade from the larger establishments. That time has not quite arrived, and hence plating transactions have been chiefly with heavy consumers. But the business is quite evenly distributed among the various kinds of consumers and throughout the territory that is tributary to this market.

Pulleys, hangers, tools and other supplies continue in good demand. The bicycle factories have not yet started up, but the season, it is expected, will open before the close of the month.

Crude iron and steel are entering into trade in apparently unchecked volume. There has not been much new buying during the past week, but the general rule among mills is that there are heavy order books and new trade is not energetically sought. The continuance of these conditions seems assured for some time ahead. Sales agents here have in some instances received instructions to refrain from entering into much new liability by way of agreements to deliver product. These instances are, perhaps, the exception, but they are more common than for a long time.

The Chicago Belting Company has fully recovered from the effects of the fire in its factory in August, and has now caught up with its orders.

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Quotations.

NEW YORK, Monday, October 10.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 25 @ 11 50
No. 2 foundry, Northern	10 75 @ 11 00
No. 2 plain, Northern	10 50 @ 10 75
Gray forge, Northern	10 00 @ 10 25
No. 1 foundry, Southern	11 25 @ 11 50
No. 2 foundry, Southern	11 00 @ 11 25
No. 3 foundry, Southern	10 75 @ 11 00

Quotations continued on page 39.)

Miscellaneous Wants—Cont'd.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

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For Sale—A modern equipped machine shop in a good manufacturing town. For particulars address BOX 22, AMERICAN MACHINIST.

Institutions retiring from business having machine tools, brass or wood working machinery, will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach Co., 55-59 Woodbridge st., W., Detroit, Mich.

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Almond Drill Chuck.

Sold at all Machinists' Supply Stores.

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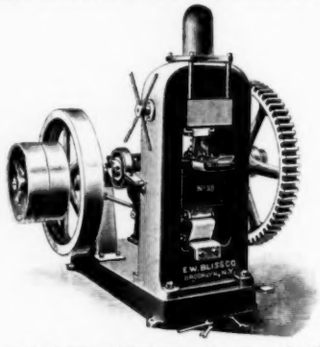

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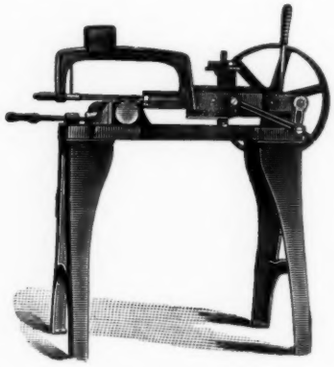

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Shop Saws,

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For All Purposes.

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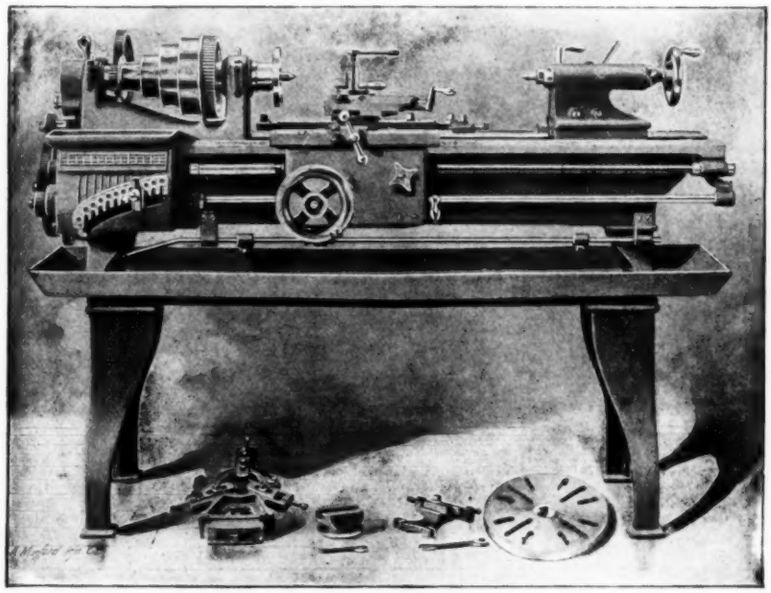
12-in. Hendey-Norton Tool-Room Engine Lathe.



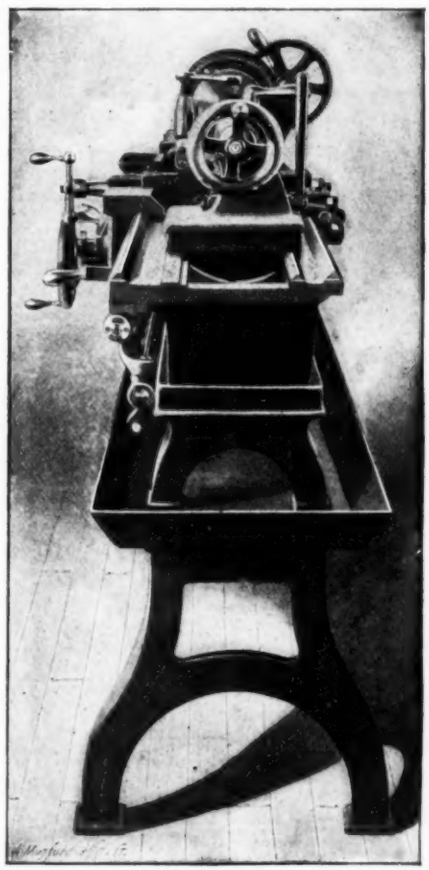
Complete in every respect as our larger sizes of lathes.

Especially designed for work in tool-rooms, experimental stations, and fine machine and repair shops. Fitted with either rise and fall or plain carriage. With or without improved taper attachment in connection with plain carriage.

This Lathe can be fitted with wire chucks in any decimal under half inch, which are invaluable for finishing small taps, reamers, special screws and studs, and other work right from the rod—no cutting off and centering of work required.

Cross-feed screw graduated to thousandths of an inch.

Beds made in 4 ft., 5 ft., and 6 ft. lengths.



END VIEW OF THE HENDEY-NORTON ENGINE LATHE.

The

Hendey Machine Co.,

TORRINGTON, CONN.

Agents for the Pacific Coast: Pacific Tool & Supply Co., San Francisco, Cal.
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(*Quotations continued from page 38.*)

No. 1 soft, Southern..... 11 25 @ 11 50
No. 2 soft, Southern..... 10 75 @ 11 00
Foundry forge, Southern..... 10 00 @ 10 25

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.05 @ 1.10c.; refined, 1.15 @ 1.20c. Store prices: Common, 1.30 @ 1.35c.; refined, 1.35 @ 1.50c.

Tool Steel—Base Sizes—Standard quality, 6 @ 7c., with lower prices on some brands; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinar brands, from store, in small lots, 1.45 @ 1.50c.

Cold Rolled Steel Shafting—Base sizes, from store, 2.20 @ 2.25c., according to quantity.

Copper—Carload lots, Lake Superior ingot, 12⅛ @ 12½c.; electrolytic, 12 @ 12⅛c.; casting copper, 11⅞ @ 12c., for ordinary brands.

Pig Lead—Carload lots, 3.87½ @ 3.90c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, 16.90 @ 17.00c., f. o. b.

Spelter—Carload lots, 4.85 @ 4.97½c., New York delivery for ordinary brands.

Antimony—In cask lots: Cookson's, 9½ @ 9.85c.; Hallett's, Japanese and French E. B., 9c.; United States, 8.70 @ 8.75c.

Lard Oil—Prime city, ice pressed, 43 @ 45c., in wholesale lots.

▲ ▲ ▲

Manufacturers.

The Carpenter Steel Works, in North Reading, Pa., will be enlarged by a further addition to the plant.

The enlargement of the Cassimere Mills, Lexington, Va., by adding additional machinery is now a certainty.

The Carnegie Steel Company is preparing plans for a gun factory. The plant will be located at Homestead, Pa.

Morrison's machine shop, Rochester, N. H., was destroyed by fire recently. Loss on buildings and machinery, $8,000.

The Portland Cement Company, of Utah, has leased oolitic limestone lands about Bedford, Ind., and will erect a $125,000 plant.

The Elizabeth Knitting Mill, Norfolk, Va., is being fitted for the addition of more machines, and a new machine shop will be erected.

The Sumac Works, Ravenswood, L. I. City, N. Y., are adding another building to their present plant, to be used in manufacturing.

Ground was broken recently for a power house for the Independence Mill Company, Independence, Ga. The building will be erected on the south of the mill, and will be 36x60 feet in size.

The Talbot Machine Works, Richmond, Va., have been leased to parties who will build the war ships lately awarded to W. R. Trigg, of the same city. The works will be further equipped with modern machinery.

The Union Carbide Company, of Niagara Falls, recently closed a contract whereby 5,000 additional horse-power will be supplied it by the Niagara Falls Power Company. It is stated that the Carbide Company will erect an addition to its factory at a cost of $100,000.

At a recent meeting of the stockholders of the American Screw Company, Providence, R. I., the directors of the corporation were directed to dispose of the company's plant at Leeds, England, and to take such action in regard to the Canadian plant as they deemed expedient.

The Improved Match Company will make additions to its plant on the west side of Bellevue avenue, between Frederick street and Kirby avenue, Detroit, Mich. There will be an addition of brick in the rear, 43x48 feet in size and three stories high, and a side addition 30 feet square and two stories high.

The Fries-Breslin Company, of Ferry avenue and Everett street, Camden, N. J., will build a new factory opposite its present plant. The building will be 50x100 feet, and will be a two story brick structure. The Farr & Bailey Manufacturing Company, of the same place, has now in course of erection an addition to its extensive plant at Kaighn avenue and the West

Jersey Railroad, and is having plans drawn for another brick addition, to be used in the manufacture of oilcloths.

R. S. Whitney contemplates erecting a machine shop on Union street, Lisbon, Me.

Sykes Brothers, of Philadelphia, Pa., are erecting a five-story addition and will install new machinery.

Messrs. Hill, Bosley, Wells and several others have purchased the machinery in the old George N. Goodspeed shop, Winchendon, Mass., and will engage in the manufacture of woodworking machinery.

H. S. Crombie Rivet Company has been organized at Portland, Me., for the purpose of manufacturing and dealing in machinery and tools, with $500,000 capital stock. The officers are: President, Frank M. Davis, of Cambridge, Mass.; treasurer, John J. Dixon, of Woburn, Mass.

The Gisholt Machine Company, Madison, Wis., has decided to remain in that city, and will build new and much larger shops. Plans have been completed for the new plant, the main building to be 300x112 feet in size, of fireproof construction, equipped with a 10-ton electric traveling crane for loading cars and for other purposes.

Work has begun on the erection of the 12-pot window plant of the Jones Glass Company at Hartford City, Ind. The main buildings will be 90x100, 75x120 and 35x120, and will be on the most modern pattern, and constructed with the view of replacing the furnace next year with a 30-blower tank. The firm is composed of W. R. Jones and his son, W. A. Jones.

The Superior Drill Company, Springfield, Ohio, will, this season, build an addition to its main shop, 147 feet, four stories high, with an L the same dimensions, for storage purposes. The foundry will have a 75 foot addition, and new cupola with 15 tons capacity. This is to accommodate the fast increasing business of the company.

There was incorporated recently a company to be known as the J. H. Murphy Manufacturing Company, whose plant is to be located in the city of Cohoes, N. Y. The new company is capitalized at $150,000, and has purchased from E. W. Greenman, assignee for Stephen W. Barker, the Clifton mill property on Remsen street, four stories high, 75 feet wide and 400 feet long.

▲ ▲ ▲

New Catalogs.

There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9 size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible

From the B. F. Sturtevant Company, Boston, we have received Catalog No. 106, in which is described the Sturtevant hot blast apparatus for heating purposes. The construction of these heaters is gone into in detail. The catalog is 3¾x9 inches.

The Richards Machine Tool Company, London, England, has sent us catalog of tool grinding machinery for grinding milling cutters, reamers, and other tools. A number of views showing examples of grinding various tools are presented. Illustrations of a number of machine tools, such as boring mills, planers and radial drills, are included. The catalog is standard size, 6x9 inches.

Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., has sent us catalogs Nos. 200 and 201. No. 200 describes in detail the construction of generators and rotary transformers for electrolytic work. Outline drawings of various generators are given. Catalog No. 201 describes and illustrates polyphase inductor generators. Some examples of such generators are shown. Both catalogs are 7x10 inches.

For Business, not show.

This Reamer has no unnecessary finish, but it is made of the best tool steel, and made right.

Especially recommended for reaming rivet holes with air motors or by hand. Cut well and outlast any other reamer. Try them once.

C. H. Haeseler Co.,

Pneumatic Tools and Appliances.

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The trouble is,
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We're well equipped in a modern way, and have been building nothing but the best of work.

Such work as the "Linotype" Machine—invented by Mr. Mergenthaler—and all sorts of automatic machinery and special tools.

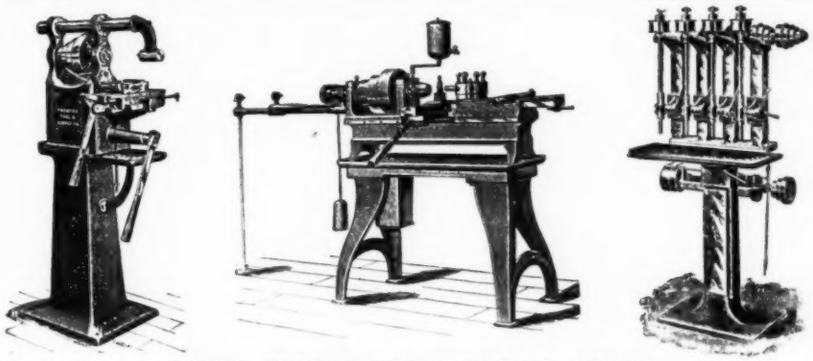
Our shop was built to handle the best of work, and our workmen have all been trained in the same direction.

We'd like contract work on typewriters, cash registers, composing machines or kindred articles, where intelligent mechanical skill is necessary.

We are in a way to quote some very attractive prices on contract work, and quality will be all you can desire.

We'd rather have large contracts than small ones. We can handle the large ones without any trouble. That's what the shop was designed for. But we're not turning the small ones away.

Ott. Mergenthaler & Co., Baltimore, Md., U. S. A.



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Implements are adjusted at a temperature of 75°.

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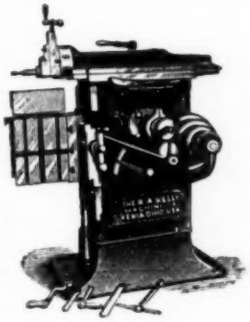
15, 16 and 20 in.

Quick Adjustment. Powerful and accurate in construction.

Easy of operation.

Write us about them.



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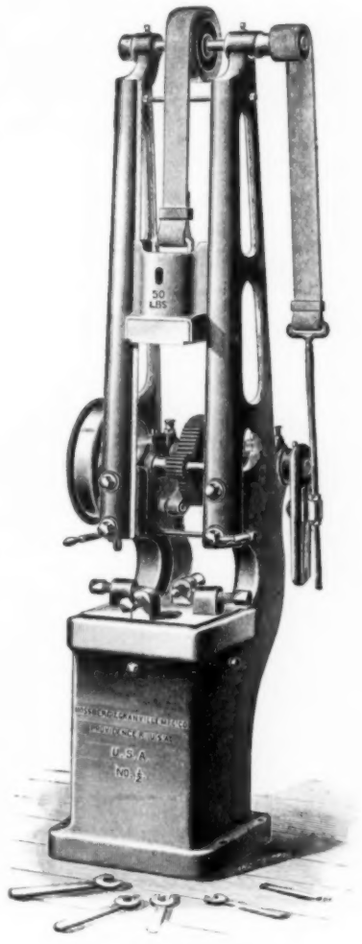
Automatic Drop Presses

OF ALL SIZES, FROM 50 TO 1,000 Lb. HAMMERS.



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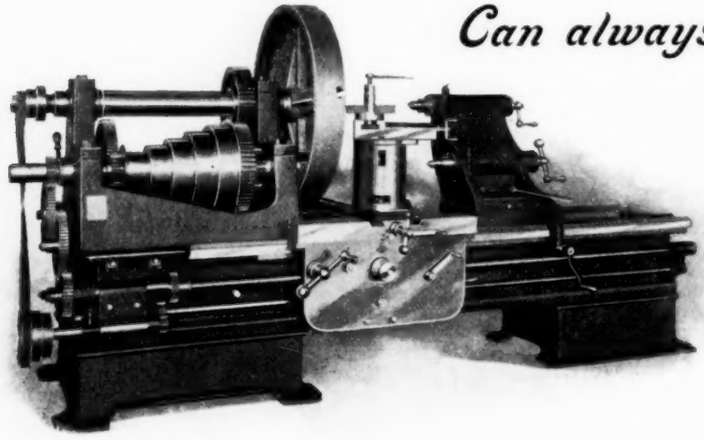
This is the "Double Spindle" Lathe—

Can always be kept agoing.



WITH INTERNAL GEARED FACE-PLATE.

This is actually two lathes in one, combining a 26-inch for the common range of work, and a powerfully triple-geared 44-inch swing for the heaviest classes of work. Swings 39 inches over the carriage, equal to a regular style 54-inch swing. Has wide screw-cutting range from 12 threads to the inch to 3 inch P. Has internal geared face plate geared 66 to 1 for heavy work.

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Those Standard Grinders—designed and built by those who know what grinding machinery is called upon to perform. The "Green" Grinder Book tells the tale.

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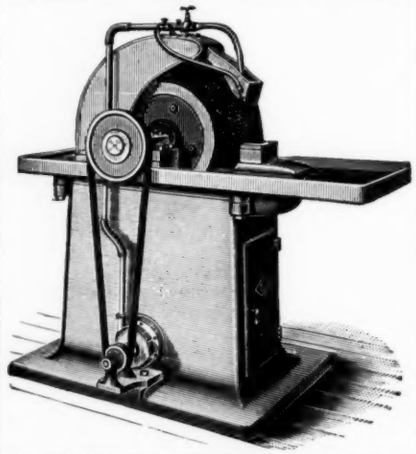
We make five sizes of Water Tool Grinders.



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Honest Jacks

made from the best of material by careful workmen; designed for every possible service that a jack can be put to. 257 kinds. Jackology for the asking.

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THE ONLY TAPPING ATTACHMENT

THAT HAS STOOD THE TESTS OF TIME IN ACTUAL SERVICE.

Combines all that can be desired in such a tool.
Can be used in any machine having a revolving spindle.

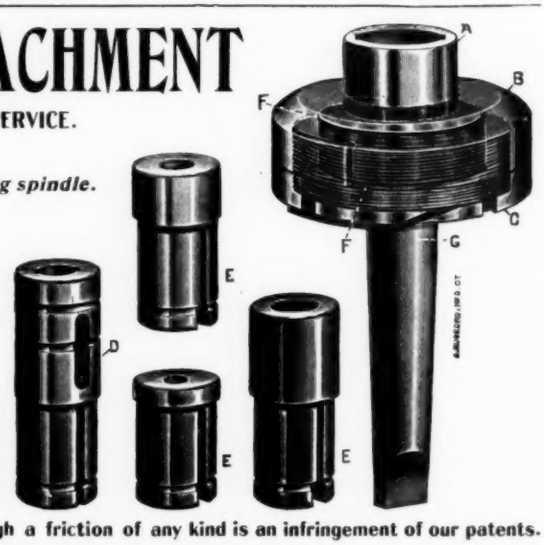
IT IS SIMPLICITY SIMPLIFIED.

Nothing to break, nothing to wear out.

Effects an ENORMOUS saving in TIME.
Effects an ENORMOUS saving in LABOR.
Effects an ENORMOUS saving in COST.

WORK DONE ACCURATELY, QUICKLY, WELL.
CAN YOU AFFORD TO BE WITHOUT IT?

Yours on trial if desired—at least inquire about it.



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Any tapping device transmitting power through a friction of any kind is an infringement of our patents.

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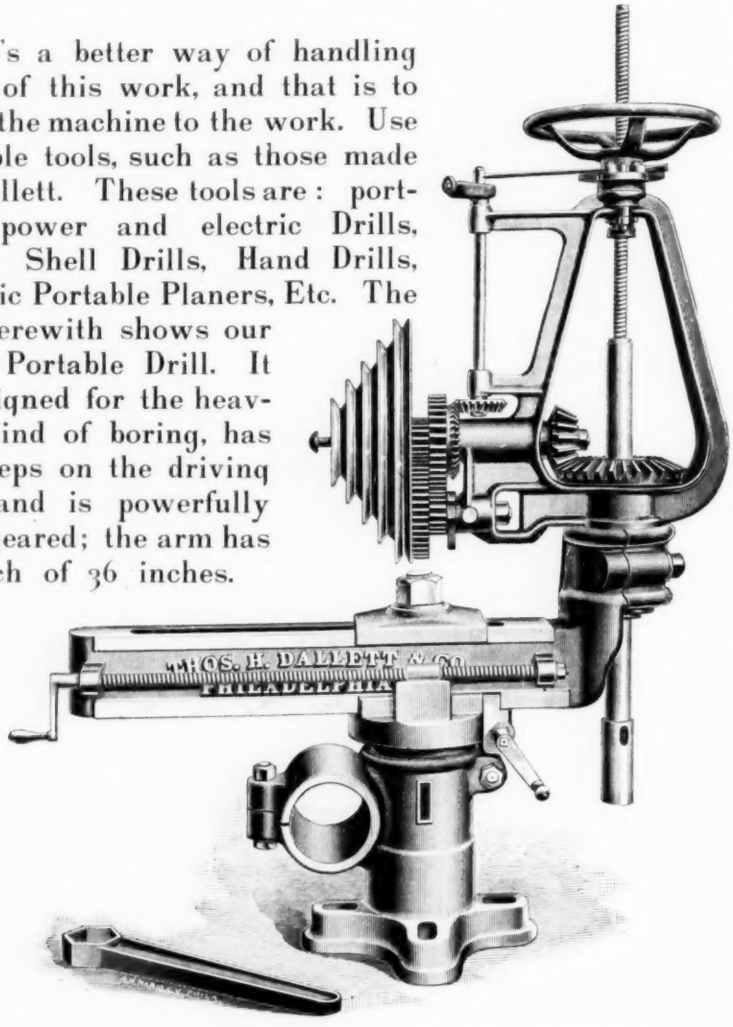

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14 in. x 6 ft. Blaisdell, raise and fall rest. 9 in. 3-jaw chuck.
14 in. x 6 ft. Fitchburg, compound rest.
14 in. x 6 ft. Le Blond, plain rest.
14 in. x 6 ft. Blaisdell Turret Lathe.
15 in. x 5 ft. Windsor, raise and fall rest. 12 in. 4-jaw chuck.
15 in. x 6 ft. Porter, raise and fall rest, 12 in. chuck.
15 in. Chucking Lathe, Jones & Lamson.
16 in. x 6 ft. Blaisdell, raise and fall rest.
16 in. x 6 ft. Pond, raise and fall rest.
16 in. x 8 ft. Pratt & Whitney, plain rest.
18 in. x 8 ft. Munzer, plain rest.
20 in. x 6 ft. Pond, comp. rest.
20 in. x 7 ft. Ames, plain rest.
20 in. x 12 ft. Pond, plain and compound rest.
20 in. x 13 ft. Harris, plain rest.
21 in. x 6 ft. Flather Turret Lathe, friction, B. G., auto. feed, 15 in. chuck.
23 in. x 10 1-2 ft. Paisley, plain rest.
24 in. x 12 ft. raise and fall rest.

PLANERS.

12 in. x 18 in. x 16 in. Willetts.
15 in. x 15 in. x 3 ft., maker unknown.
16 in. x 16 in. x 3 ft. Pratt & W.
18 in. x 24 in. x 4 ft., with 14 in. centers.
23 in. x 23 in. x 4 ft., Pond.
24 in. x 24 in. x 9 1-2 ft. Pond, chuck and centers.
36 in. x 30 in. x 8 1-2 ft., maker unknown.

SHAPERS.

6 in. Boynton & Plummer, hand power.
6 in. Gould Bros.
9 in. Wood & Light, trav. hd.
12 in. Pratt & Whitney.
12 in. Juengst.
15 in. Hendey.

SHAPERS—Cont.

15 in. Wood & Light, trav. hd.
18 in. Wood & Light, trav. hd.

DRILL PRESSES.

10 in. Bench Drill.
10 in. D'A. & L., with chuck.
28 in. Lodge & D., back gear, power feed, chuck.
28 in. Wood & Light.
9 ft. Holly Radial Drill.
2, 3, 4, 6 and 7 spindle Gang Drills.

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No. 0 Universal Garvin.
No. 1 Pratt & W., plain.
No. 2 Garvin, plain.
No. 3 Garvin, plain, 2 vises.
No. 4 Garvin, rack feed, without arm.
No. 11 Garvin, vertical attach.
No. 2 Garvin auto. Sprocket Wheel Miller.
No. 2 Becker Vertical Miller.
New No. 15 Brainard Universal.
Pratt & Whitney Circular Miller.
No. 2 P. & W. Lincoln.
No. 3 Garvin Lincoln, '94 pat.

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1 2½ in. x 6 ft. Flather Turret Lathe, back gears and auto. feed to turret.
1 1¼ in. Garvin Turret Lathe, with pan.
2 Garvin No. 1, wire feed.
2 Brown & S. No. 1, wire feed.
No. 2 Garvin, wire feed, forming cross slide.
Garvin No. 2 1-2 wire feed.
No. 2 Pratt & Whitney, plain.
No. 2 Windsor, w. f., chasing bar and tools.
1 No. 4 Warner & Swasey, geared friction head, oil pump and 2 jaw chuck.
No. 5 Brown & Sharpe, chasing bar.
2 Pratt & W. Hub Machines, geared friction head, oil pump and 2 jaw chuck.

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No. 3a Mossberg, roll feed.
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Several Foot and Screw Presses.

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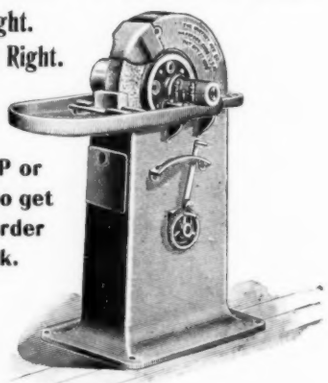

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Powell Planer Company's Heavy Pattern Planer, 48 in. x 48 in. x 12 ft. with two heads, A1 order.
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D. W. Pond Engine Lathe, 28 in. swing, 14 ft. bed,
Flather Engine Lathe, 24 in. swing, 12 ft. bed, with 2 in. hollow spindle, chuck, etc.
Flather Engine Lathe, 18 in. swing, 8 ft. bed, with 1½ in. hollow spindle, chuck, etc.
Blaisdell Engine Lathe, 16 in. swing, 8 ft. bed.
Flather Engine Lathe, 14 in. swing, 6 ft. bed.
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Niles Radial Drill, 5 ft. arm, plain.
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Pratt & Whitney Screw Machines, Nos. 1 and 2, wire feed.
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Prentiss Shaper 12 in. stroke, crank motion.

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One second-hand 10 x 10-inch 15 H. P. vertical engine, built by New Yokr Steam Engine Company; driving wheel, 48 x 12 in.; about 8 feet high; in first-class condition; been in use about 15 years. Address "Engine," care of AMERICAN MACHINIST,

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9—16 in. Flather Lathes.
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13 in. x 6 ft. Ames.
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14 in. x 6 ft. Prentice.
15 in. x 5 ft. Sheperd.
16 in. x 7 ft. D. & H.
18 in. x 12 ft. Bogart.
27 in. x 12 ft. Wood & Light.
28 in. x 12 ft. G. & E.
48 in. x 18 ft. Gay & Silver.

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No. 1 Wire feed.
No. 2 Wire feed.
No. 2 P. & W., plain.
No. 2 1-2 P. & W., wire feed.
No. 4 Windsor, plain.
No. 4 Windsor, wire feed, auto.
No. 2 Niles, heavy.

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16 in. x 16 in. x 4 ft. Hendey.
22 in. x 22 in. x 4 ft. Pease.
24 in. x 24 in. x 4 ft. Wood & Light.
26 in. x 26 in. x 5 ft. Powell, with chuck.
28 in. x 28 in. x 8 ft. Gay & Silver.
30 in. x 30 in. x 6 ft. Putnam.
60 in. x 60 in. x 22 ft. Hepworth.

SHAPERS.

9 in. Traveling head, Sellers.
13 in. Traveling head, Bement.

SHAPERS.

14 in. Steptoe.
20 in. G. & E., with circular motion.

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6 spindle Quint.
Pond suspension.
22 in. G. & E., back geared.
32 in. G. & E., back geared.
34 in. Harris, back geared.
38 in. Wood & Light.

MISCELLANEOUS.

24 in. Lead Lapping Machine
No. 2 Water Tool Grinder, Springfield.
Centering Machine, Whitton.
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Special Cam Miller.
24 in. Gear Cutter, G. & E., half automatic.
36 in. Hand Gear Cutter, G. & E.
Lincoln Type Milling Machine, P. & W.
48 in. x 12 ft. Hor. Boring and Drilling Machine.
16 in. x 8 ft. Pattern Makers' Lathe, milling machine attachment. Fay & Scott.
12 in. Thompson Splitting Shear.
36 in. Band Saw, B. & O.
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50 in. x 20 ft. Fifield.
48 in. x 20 ft. Sellers.
38 in. x 20 ft. Davis & Egan.
28 in. x 27 ft. Fifield.
27 in. x 10 ft. Davis & Egan.
24 in. x 20 ft. Fifield.
24 in. x 10 ft. Scott.
20 in. x 12 ft. Porter.
18 in. x 8 ft. Blaisdell.
16 in. x 6 ft. Reed.
15 in. x 6 ft. Porter
14 in. x 6 ft. Davis & Egan.
12 in. x 5 ft. Silk.
10 in. x 4 ft. Frasse.

MISCELLANEOUS.

26 in. Davis & Egan Shaper.
17 in. x 17 in. x 4 ft. Putnam Planer.
30 in. x 30 in. x 6 ft. Putnam Planer
30 in. x 30 in. x 8 ft. Star Planer.
36 in. x 36 in. x 12 ft. Davis & Egan Planer, with 2 heads.
Hand Miller, Garvin
Universal Miller, Kempsmith
Lincoln Miller, Pratt & Whitney
12 in. x 5 ft. Turret Lathe.
18 in. x 6 ft. Turret Lathe.
40 in. B. G., P. F. Drill, Lodge & Davis.
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32 x 23 New Haven, C. R. & P. C. F.
29 x 18 Ames, C. R., P. C. F. and 3 in. H. S.
23 x 8 Putnam, R. & F. rest.
21 x 12 Wright, R. & F. rest, 2 chucks.
20 x 8 New York Steam Engine Company, P. G.
20 x 8 Fifield, C. R. & P. C. F., fine.
19 x 12 Pond, C. R., P. C. F. and 16 in. chuck.
19 x 8 Lodge & Barker, C. R. & P. C. F.
18 x 20 Pratt & Whitney, P. G., S. W. rest.
18 x 14 Pratt & Whitney, P. G., S. W. rest, 14 in. chuck.
18 x 10 Flather, P. G., P. C. F. and 12 in. chuck.
18 x 6 Lodge & Davis, P. G. & P. C. F.
18 x 6 Eddy, P. G. & P. C. F.
18 x 6 McMahon, C. R. & P. C. F.
18 x 21 Engine Lathe, P. G.
17 x 10 Pratt & Whitney, plain turning with ck.
17 x 8 Putnam, R. & F. rest and P. C. F.
2 16 x 7 J. L. Bogart, R. & F. rest.
14 x 6 Lodge & Davis, C. R. & P. C. F.
14 x 7 J. L. Bogart, R. & F rest.
14 x 6 F. E. Reed, R. & F. rest and P. C. F.
15 x 6 Star Tool Co., R. & F. rest and taper attch.
15 x 6 Pratt & Whitney, R. & F. rest and 9 in. ck.
15 x 6 Porter, R. & F. rest, 10 in. chuck.
15 x 6 Prentice Brothers, R. & F. rest.
15 x 6 Pond, R. & F. rest.
15 x 6 Flather, R. & F. rest.
14 x 6 Putnam, R. & F. rest.
14 x 5 Porter, R. & F. rest, 1⅝ in. H. S. and 6 in. ck.
15 x 6 Porter, plain turning, with grinding attach.
13 x 5 Ames, R. & F. rest with chuck, fine.
2 12 x 5 Star, P. G. & P. C. F.
10 x 5 Reed, R. & F. rest and chuck.
No. 1 Star, foot power.
62 in. New Haven pulley lathe, C. R. & P. C. F.
28 in. Stevens pulley.
3-26 in. Stevens pulley.
40 in. Pulley.
16 x 6 Lodge & Davis, Fox monitor, friction head.
15 x 6 Lodge & Davis, Fox monitor, friction head.
15 x 5 Gage, Fox monitor.
15 x 5 ft. 6 in. American T. & M. Co., square arbor, Fox.
16 x 6 Roberts, square arbor, Fox.
16 x 6 Robbins, pat. makers' with carriage.
2 17 x 8 speed lathes, wheel feed.
12 x 4 Hill, speed, lever feed.
11 x 4 Spencer, lever feed

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8 ft. Betts Bending Rolls, fine.
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15 lb. Bradley Strap Hammer.
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2 ¼ in. Adt Riveting Machines with C. shaft.
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Chain Testing Machine for testing tensile strength of 2 in. chain.
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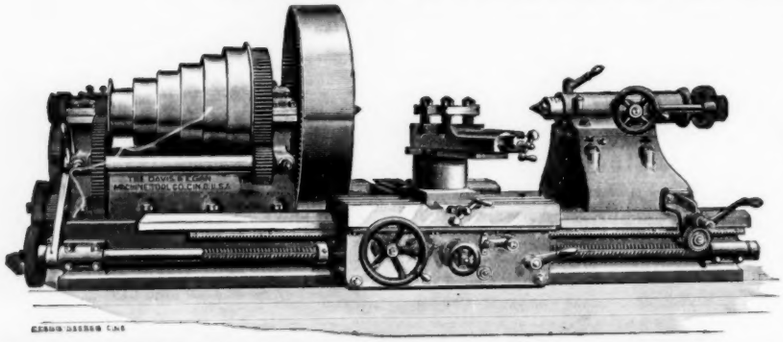

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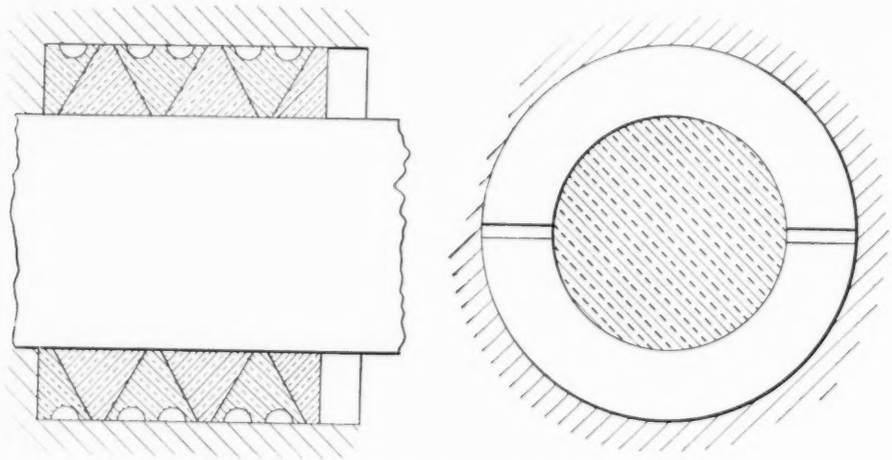

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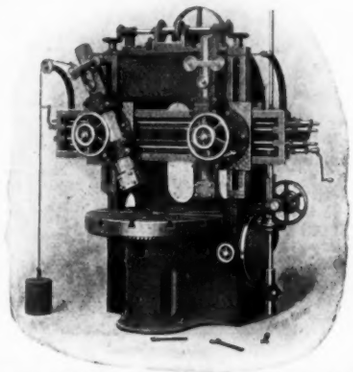

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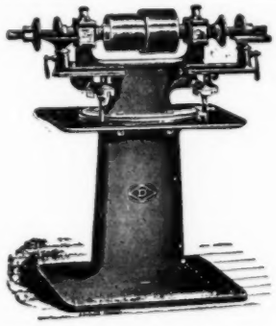

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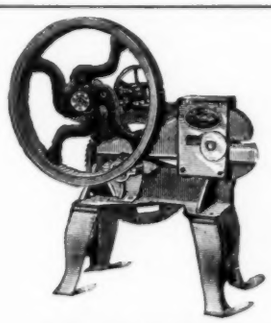

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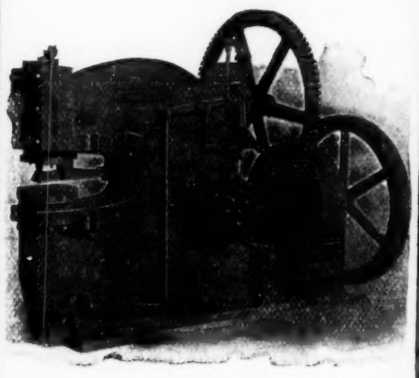

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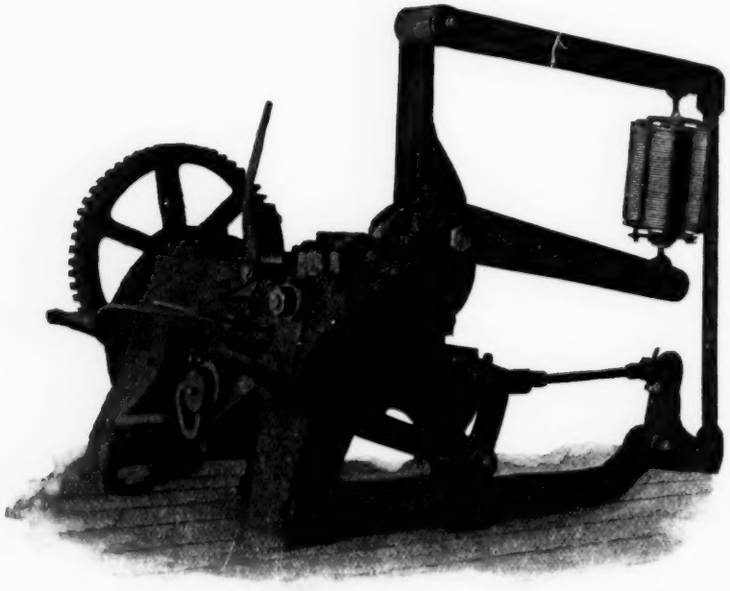

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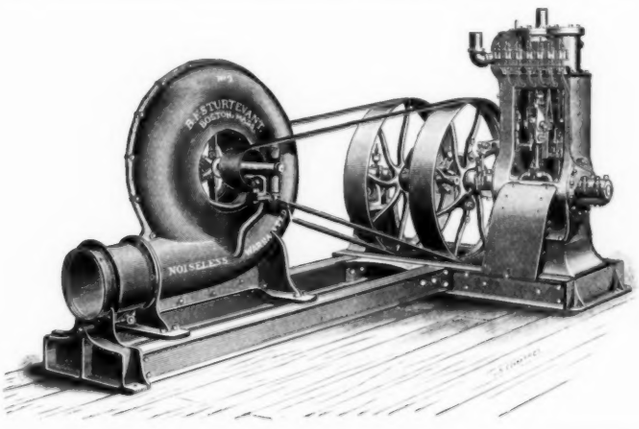

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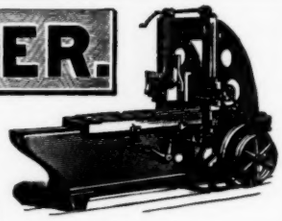

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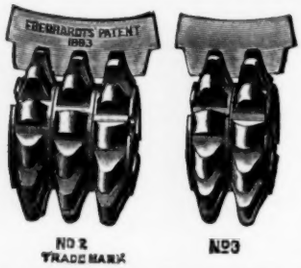

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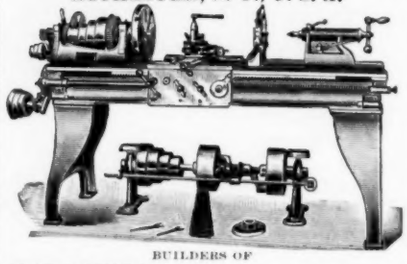

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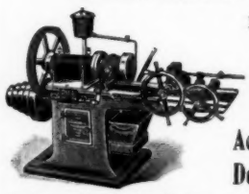

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